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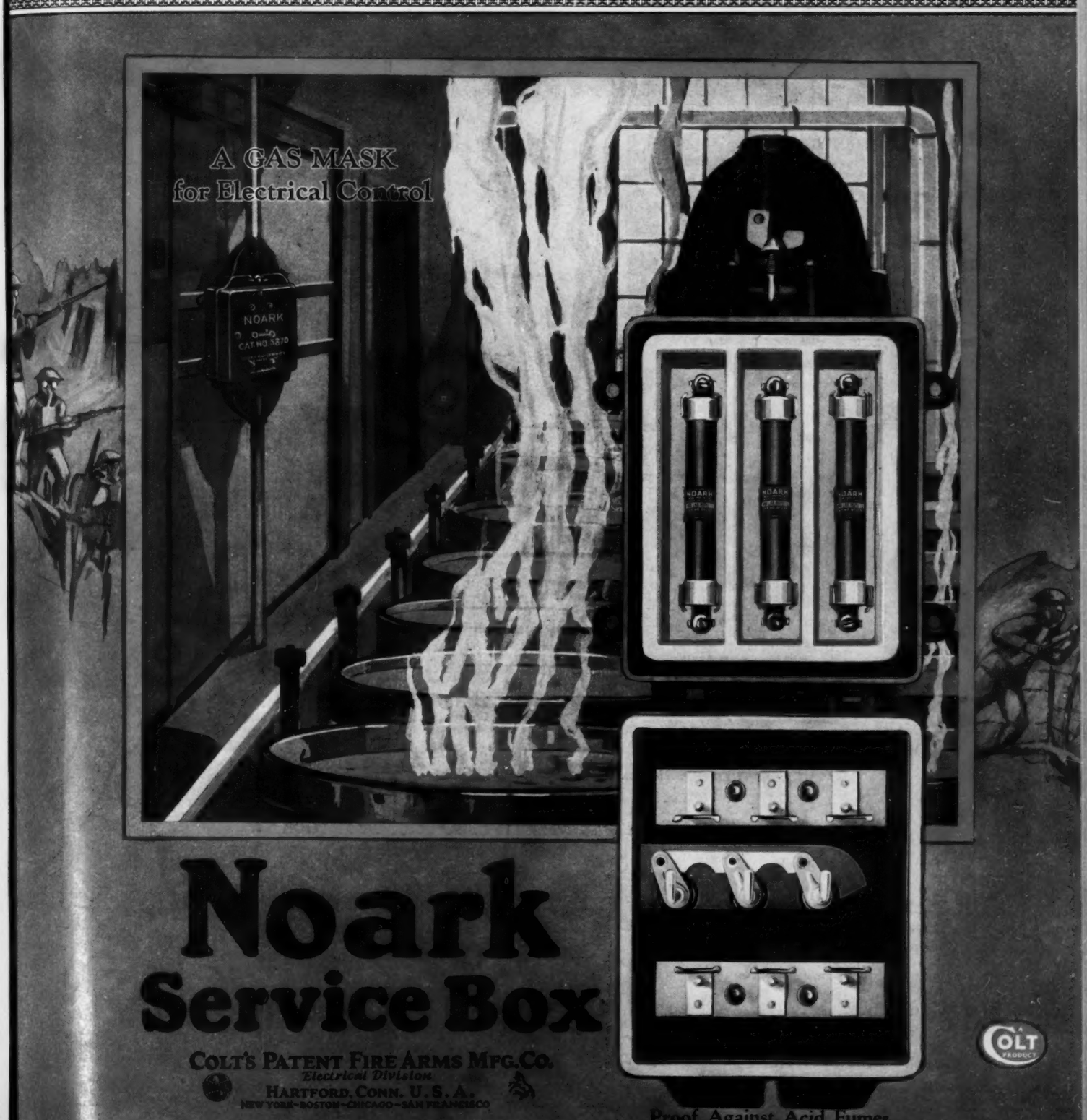


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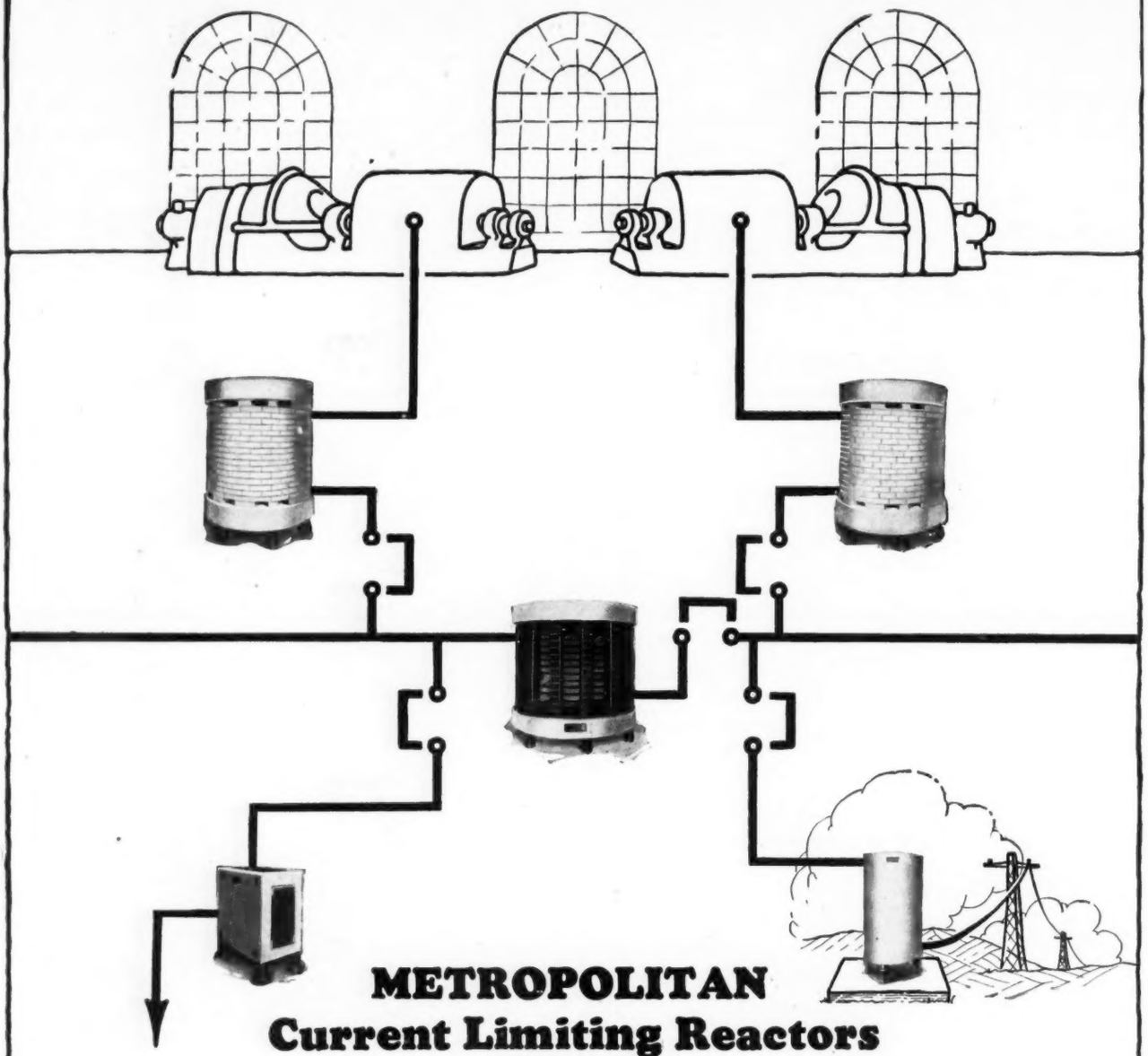

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# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

W. H. ONKEN, JR., *Editor*

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*On the 15th of every month you can have this wide-awake magazine without charge if you ask us today.*

# A RESTLESS ORGANIZATION

"This is a restless organization," a visitor said, recently. "I have been here several times and you never seem to be satisfied with things as they are. You seem always to want to improve everything." . . . . . .

That restless spirit of dissatisfaction with the past has carried this company through many years and is its chief dependence for the future. Satisfaction with oneself—often spells stagnation . . .

Fifteen years ago there were just two kinds of high tension equipment—indoor and outdoor—and the gulf between them was vast . . . . . .

"Why," asked one of the founders of this company, whose bump of curiosity was not only large but his mind restless, "Why should this be so? Why can't outdoor equipment at least approach the good appearance and perfection of indoor equipment?" . . . .

Receiving no satisfactory answer he investigated the outdoor equipment being used in various parts of the country and found that as a general rule it was simply an assembly of standard line insulators and a heterogeneous lot of metal fittings. . . . . .

The final result was a nondescript lot of air break switches, fuse mountings, etc., which after mounting on a wood structure had the appearance of a delapidated shanty. . . . . .

Then he and his engineers sat down with several public utility engineers and drew up specifications which would not only raise the standard of appearance but also establish a standard of dimensions for the insulator units. . . . . .

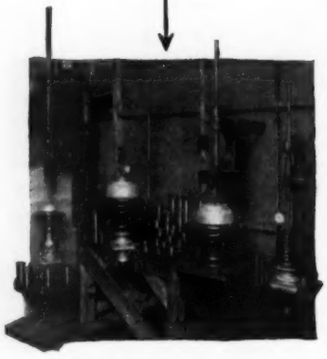
For instance, the new specifications called for an accuracy in insulator dimensions and matched color of shells, unheard of at that time. Some insulator manufacturers scoffed at us, but the ones who today are leaders, co-operated with us to the fullest extent. . .

As time went on, others saw how much better looking and how much more interchangeable were the units made the new way. Many followed our lead and frequently we are told that this pioneering effort has raised the standard of all high tension equipment throughout the country. . . . . .

So today you can secure outdoor equipment of appearance, of quality and at a price comparable with high grade indoor equipment. And, to that restless spirit of dissatisfaction with things of the past can, in a large measure, be credited the progress made during the past ten years in this branch of the industry. . . . . .

A. W. Young
President

**DELTA-STAR ELECTRIC COMPANY**
**2400 Block, Fulton St., Chicago, Illinois**



MASTER GAUGES FOR CHECKING ACCURACY OF CEMENTING JIGS

# Electrical World

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W. H. ONKEN, JR.
*Editor*

VOLUME 90 — *New York, Saturday, November 26, 1927* — NUMBER 22

## *Interconnection Applies to Finance as Well as Power*

IN HIS Chicago address last week Samuel Insull made a very helpful and important contribution to the current discussion of the present trends of the power business. By a frank and plain statement of his own experiences involved in the evolution of electric power supply in the territory adjacent to Chicago he described the natural course which had been followed in bringing service to small isolated communities by the very practical expedient of building an efficient modern station, centrally located, and substituting dependable distance transmission for the former small-town plants, many of which had given no daytime service. For the same reasons of improved efficiency and money saving, these small groupings were gradually combined into larger and more economical systems, and in turn these unit systems have been gathered into operating companies to provide greater facilities for engineering and management. So grows the power industry. And the concentrations of capital in large holding or investment organizations are as natural and as desirable as was the linking together of the initial small-town plants. The principle has been the same throughout.

Mr. Insull's address is published in part in this issue. He spoke to a sympathetic audience of electrical men of all branches of the industry, gathered for the annual dinner of the Chicago Electric Association and numbering many distinguished utility executives from all parts of the country. It was a masterly presentation of the spirit and purpose of the power industry and an interpretation of the public interest in electric power development that should be studied carefully by all electrical men. It comes at a time when it should prove most interesting and most careful.

* * * *

## *The Edison Report and the Cost of Wiring*

EVER since Edison devised the first materials and fittings electric wiring has steadily evolved in the direction of greater safety and higher cost. This has been only natural, in line with the progress of the art and the development of the industry. It has kept pace with the general upward trend in the expense of manufacturing. It has followed the typical course of the rising standards of quality, safety and service that have been so marked throughout American industry in the last quarter century. But it has apparently now reached a cost level sufficiently high to attract attention to the possibilities for introducing practical economies that will save money by facilitating installation. And this also is in the line of progress.

The new movement toward the ingenious simplification of wiring methods has been indicated by three recent conspicuous examples. Non-metallic sheath cable aimed to provide a cheaper substitute for armored cable for use principally in house wiring. It fought a long and valiant fight for acceptance by the code and was finally admitted under limitations. Thin-wall conduit is now in process of test and discussion and seems destined for recognition as a less expensive form of rigid armored job. And the very radical experiments which have just been conducted by the sales managers of the Association of Edison Illuminating Companies in the attempt to plumb the possibilities for developing an armored conductor of small diameter that can be installed in the plaster of the wall or ceiling, especially as applied to the rewiring of old homes, are just another more ambitious adventure in the same general direction. The report of this association's work has just been released for publication and appears elsewhere in this issue.

Two points should be kept in mind, of course, in deliberating upon this whole theme of the cost of wiring. Obviously any saving that can be made either through cutting the cost of materials or through improved methods is welcome. There must be continued progress in wiring practice. But this must be achieved without the sacrifice of safety, and the point beyond which provisions for safety must not be pressed requires a fine distinction in the public interest and for the protection of the electrical industry. And the second point, also, should not be forgotten, and that is the fact that wiring can be sold at present prices. There is no urgent need to cheapen wiring to make it salable.

* * * *

## *A Fine Piece of Public Service*

GREAT disasters call forth the finest qualities in human nature. Men and women forget themselves in devotion to duty, and unsuspected powers of initiative and edurance leap into service in response to critical needs. The utility companies of New England met the test of the recent flood in a way that brings a thrill of pride to whoever reads between the lines recording their efforts to keep plants and lines in operation, to succor the distressed and to restore interrupted service. Another fine chapter has been written in the history of the electrical industry, for all branches took part in the fight, and those who manufacture, distribute and install apparatus and supplies co-operated with the service companies to the limit of their powers in meeting the emergency. New England has no monopoly in ability and will to respond to crises, as the record of other sections of the country has repeatedly shown in this very year, but she performed a splendid piece of work in the face of unprecedented stress, considering her normal climatic conditions and geographic handicaps.

To engineering foresight is due high credit that the

disaster was not far greater. The money spent on the regulation of the Deerfield River by the New England Power Company proved one of the best investments ever made in hydro-electric practice. The achievements of interconnection in the Connecticut Valley and elsewhere within the past decade became of untold value in meeting the crises of the flood as it swept down the steep hillsides and through the valleys on its way to the sea. Reserve capacity in tidewater steam plants was at the disposal of interior systems, and in many of the larger centers few customers suffered even from poor regulation. Vermont and parts of New Hampshire were hit hard, but even here interconnection soon began to remedy acute local situations. The alertness of the Boston Edison company in sending its portable radio broadcasting station into White River Junction and in utilizing its home station, WEEI, to bridge terrible gaps in communication and flood news distribution from areas at first accessible only by airplane added new laurels to the public service record of this company. All along the line, from utility executive offices to tables where load dispatchers kept tireless vigil, from deluged plants where weary toilers packed heavy sandbags against rising waters out to lonely pole locations where "trouble shooters" struggled against the flood, the call of "service first" was obeyed with devotion and intelligence. In the race against winter which reconstruction crews are now making we shall see anew what skill and endurance can accomplish, and the fullest cooperation of the industry can be counted upon as the detailed needs of the stricken areas are made known.

* * * *

## *Alabama Honors an Illustrious Son*

A WONDERFUL tribute was paid to Sidney Z. Mitchell in Alabama on Monday when the development of the Alabama Power Company at Lock 18 on the Coosa River, near Wetumpka, was dedicated and designated as Jordan Dam in memory of his mother and when the University of Alabama conferred on him the degree of doctor of laws. The part that Mr. Mitchell has played in the evolution of the electric light and power industry of this country is not very generally known owing to his own reticence. Neither do people know of his influence in electrical development in Cuba, Central and South America, Japan and France. To have the leading men of his native state assemble by the thousand to do him honor for his constructive genius and far-seeing ability in developing electricity in Alabama and thus contributing to its prosperity and bright future shows that a prophet is not without honor in his own state.

True, Mr. Mitchell has shown a remarkable interest in the Alabama Power Company, and it is due to his encouragement and optimism that hydro-electric development in Alabama has made such progress. But he has also helped to build up North Carolina, Florida, Pennsylvania, Nebraska, Arkansas and many other states in the same manner. In fact, his interests stretch from ocean to ocean, and in every state where his operations extend he has shown the same constructive leadership in the public utility field for which Alabama is now so proud to honor him. His forte is finance, and it is safe to say no keener mind in the realm of finance can be found either within or without the industry.

It can be truly said of Sidney Z. Mitchell that he builds well. His faith in the electric light and power industry and in the future of the country is as refreshing and reassuring as it is tremendous. He delights to extend electric service in the highways and byways, not so much because of legal obligations to do so, but because of an inborn and very human and laudable desire to be of service to his fellow-men. And the most wonderful thing about it all is that the business is also remunerative. Therefore in honoring Sidney Z. Mitchell the State of Alabama has honored the electric light and power industry, because he is, as it were, bone of its bone and flesh of its flesh.

* * * *

## *The Problem of the Jobber Still Presses for Action*

ONE step has been taken toward the solution of the problems that beset the electrical jobbers. At the winter convention of the Electrical Supply Jobbers' Association in Detroit last week it was announced that a managing director had been secured for the association in the person of Granville P. Rogers, who has been directing the national association of the fixture manufacturers. The offices of the jobbers' association are to be moved at once to New York. So far so good. But there was considerable disappointment that the leaders of the industry have not, since the partial reorganization of the Electrical Supply Jobbers' Association last May, defined a policy and set up a program that promises early action in the direction of relief. Probably it was impossible to do so until a managing director was obtained, but the passing of time only intensifies the realization that the jobbing industry is in trouble.

All in all, the jobbers seem to be having a fairly satisfactory year, with sales somewhat under the volume of 1926. But there are a sufficient number of houses operating in red ink, and conditions confronting the entire industry are so serious that there is no opportunity for complacency. And the difficulty of the situation lies in the fact that it involves some very fundamental principles. Shall the E.S.J.A. continue to represent the three strong groups—Graybar, General Electric and Westinghouse—and a small number of independents? Or shall the other independent jobbers be brought into membership, making them then probably the largest group numerically, and perhaps in terms of sales? And shall the jobbing industry now frankly raise the issue with the power industry of the cost of warehousing? It is cheaper and therefore in the public interest for the power companies themselves to warehouse enormous quantities of stores, as at present, or to rely on the presumably expert warehouse service of the jobber? And shall the jobbing industry flatly contend with the manufacturers that either they provide the economic channel for the flow of goods or they do not—and if they do that manufacturers should not bypass their distributors for large orders and leave them to languish on the pick-up business? These are the issues—blink them as we may.

But issues like these will not be settled by opinions or by arguments. It will require considerable research and statistical knowledge. It will require persistent courage and some fighting. And the objective is neither to support nor to justify the jobber as an institution but to establish the economic truth as to the function of distribution in the electrical industry. The jobbers can afford to face the facts, whether they prove favorable or not, far better than to drift longer in doubt. But the industry should not go on much longer without these facts that so concern the manufacturer, the contractor, the dealer and the central station.

## *Christmas Carols of Light*

ARTIFICIAL light from candles has been interwoven with Christmas-time observances for centuries. This is a natural consequence of the symbolism of light. With the increasing possibilities of artificial light it is natural that it should play an increasingly important part during the holiday period of happiness and good will. The lighting interests can do much to stimulate and develop this commendable custom—not for selfish reasons only, but to render a friendly service, because artificial light can do so much to increase cheerfulness at Christmas time.

The electrical organization in a community may well take the lead. Perhaps the center of interest may be a public Christmas tree studded with myriad-colored lights. A fountain or monument may be the centerpiece. The exteriors and interiors of buildings occupied by electrical firms should stand out as examples of what can be accomplished. Stores may be encouraged to light up for the holidays—not only with temporary decorative lighting but with the higher intensities of illumination which many of them should employ all year around. This is an ideal time to introduce colorful show-window lighting which may be retained permanently. The householder uses electric lamps on the Christmas tree, and many are adopting the commendable practice of lighting the foliage outdoors. The effort may be extended to decorative lighting over and around architectural features, such as windows, doorways and arches. For these purposes a new 10-watt lamp of small size is available at the ordinary line voltage.

The increasing possibilities of artificial light should give rise to its increasing use. Many millions of electric lamps will be sending forth their own effective carols next month. Lighting companies doubtless will help and guide, as they have done in former years.

* * * *

## *What Price Generation*

DETERMINED, persistent efforts by designers and power-plant engineers have resulted in splendid improvements in the combustion and turbine efficiencies of generating stations. Old standards have lost repute so quickly that the tradition has arisen that the design of a generating station is out of date before the construction of the plant can be completed. The long-sought-after ratio of one pound of coal per kilowatt-hour has been achieved and in some instances surpassed. How much further is the ratio to be reduced, and in what way may future improvements be brought about?

All the heat in the coal or oil may not conceivably be recovered, but even though this desideratum may be missed by but the smallest margin, there would still remain the impassable barrier of the theoretical thermal efficiency of known steam cycles. Superpressures may be highly commendable, mercury-vapor units may save B.t.u., regenerative cycles may be juggled to good purpose, but the laws of thermodynamics are implacable. No known heat cycle can capture more than 50 per cent of the thermal content of the steam. The high efficiencies about which engineers proudly exclaim are feeble efforts indeed when potential possibilities are considered, yet it may be assumed confidently that some better and more efficient means of producing electricity will be found, not in coal or oil combustion improvements, or in added economizers, or preheaters, or manipulated cycles, or water-cooled furnace walls, but by imaginably possible means.

Every source of energy that is accepted as potentially available comes to this world, or has come, from the sun. If light and electricity are but manifestations of closely allied phenomena, a method of direct transformation is possible without the intermediacy of boilers, steam, turbines and generators, each one with its dead line of possible efficiency. That we should have failed to find a way to transform energy stored in fuel, or in moving water, or in the heat of the earth, or through concentration of cosmic rays, does not preclude a more direct production of power. The multiplicity of intermediate factors may be reduced. Men of science and their allies, the engineers, are but on the threshold of a door to which there is no latch and which cannot now be opened, though they stand in the light that pours through and warms them.

* * * *

## *Super-Gas—Competitor or Ally?*

THE manufactured-gas industry proposes to parallel in its own field the so-called superpower system in the electrical industry. The plan involves interconnected plants, long transmission lines, gas pools and a complete service for home heating and cooking and for industrial heating. Such an undertaking is creditable to the gas industry, important for the electrical industry, interesting to bankers and investors and of real concern to the consuming public. Heretofore the manufactured-gas industry has succeeded because of inherent advantages of gas for present services. The industry had no national policy, no aggressive sales program and no leadership which took advantage of possibilities for more economical production and distribution. The manufactured-gas business depends on other fuels for its production; it competes with other fuels and with electricity for its business, and in the manufacturing process it produces byproduct fuels which compete with gas in the markets. Yet the leaders of the gas industry, despite these economic and psychological handicaps, propose a business of national scope and character. They are alert to their opportunities.

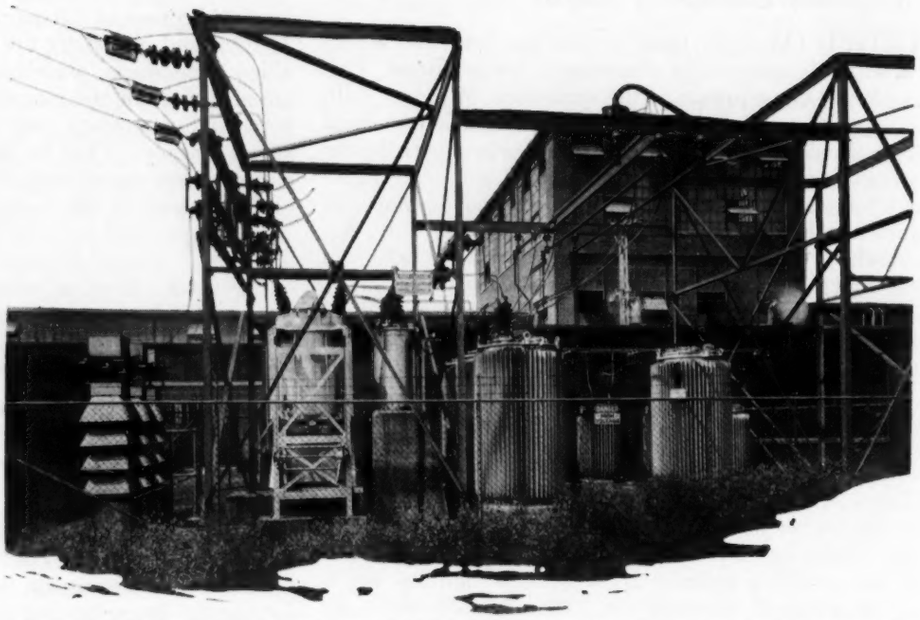
What does such a program mean to the electrical industry? Does it mean a revival of the old-time gas versus electric light competition as applied to industrial heating and ranges? Surely past experiences prove two things. One is that the agency better fitted for the service application will survive; the other is that co-operation beats competition in the development of markets. All industrial heating will not be done with gas nor will all homes use gas ranges. Electric heat fits many applications better than gas and vice versa, and the human element and local conditions will determine whether people will use the gas or the electric range. The point is that there is an unexploited market for both electric and gas service. Either can better existing conditions in industry and in the homes and both will gain by a co-operative development of the markets. For one application that is competitive there should be many that are not. The development of existing opportunities will bring about new ideas and new possibilities for both services.

Constructive efforts to expand any service will bring rewards to all industries, and the electrical industry should welcome an awakening of the gas industry. Co-operation, the adoption of sound sales policies, friendly rivalry for market exploitation and full recognition of the big opportunities for better business for both industries constitute a basic program for action. Superpower and super-gas should march as allies to conquer their markets.

# Rubber Industry Aided by Electric Service

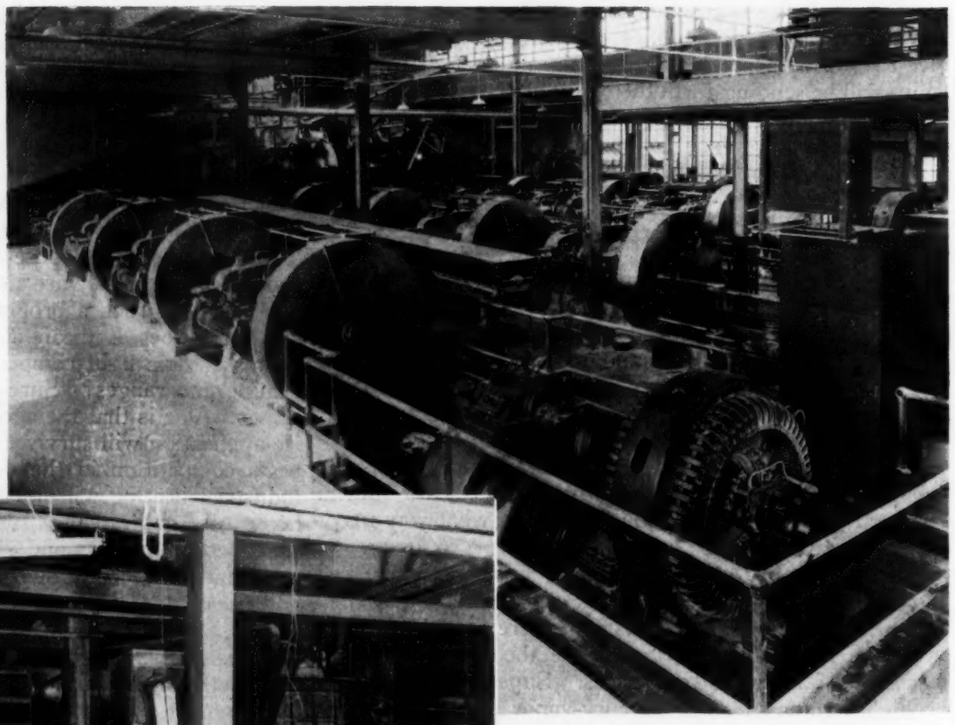
MOTOR applications find ready use in the many processes of rubber-goods manufacture. Of the 656,857 of primary horsepower used in rubber manufacturing plants in 1925, 425,218 hp., or 65 per cent, was derived from purchased energy. An additional 193,484 hp. of electric power was generated largely as a result of the process-steam requirements of this industry. The rubber mills of the United States in 1925 were approximately 94 per cent electrified.

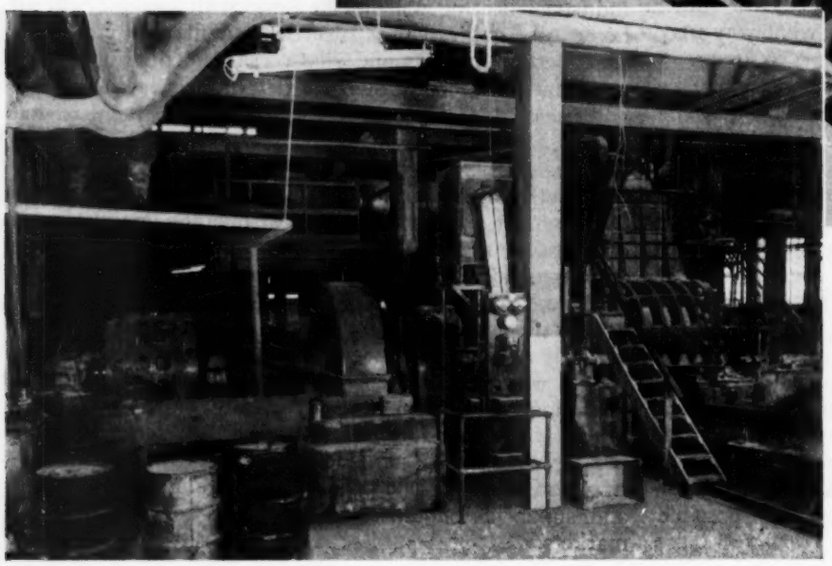
The duty requirements of the motors for these services are unusual, involving, as they do, heavy overloads of short duration, low speeds and close speed control. Modern synchronous motors are replacing the direct-current equipment previously used.



WHERE PURCHASED SERVICE IS RECEIVED BY THE KENMORE PLANT OF MILLER RUBBER COMPANY, AKRON, OHIO

Oxide film lightning arresters, 400-amp., 37,000-volt oil circuit breakers, a bank of three 667-kva., 22,000/2,300/4,000-volt Y power transformers with spare unit, three 250-kva., 2,300/4,000 Y/460-volt transformers with spare visible in background. Metering transformers appear between circuit breakers and the bank of larger transformers.





ABOVE — 250-HP. SYNCHRONOUS MOTOR WITH 131/23 REDUCTION DRIVE FOR REFINER MILLS

Refiner mills are 30 in. long, front roll 19 in. diameter, back roll 24 in diameter.

AT LEFT—500-HP. MOTOR WITH 450/98 REDUCTION GEAR DRIVES BANBURY MIXER

Capacity of machine is 90,000 lb. every 24 hours. The reduction unit ratio is 450/98.4 r.p.m. and from this pinion drives bull gear at 22/226 r.p.m. Back roll runs 13.31 r.p.m. and front roll 15.61 r.p.m.

# Modern Electrified Rubber Mill

Application of low-speed synchronous motors a recent development. Handling of some major processes. Motor characteristics. Safety features of electric control minimize labor risks

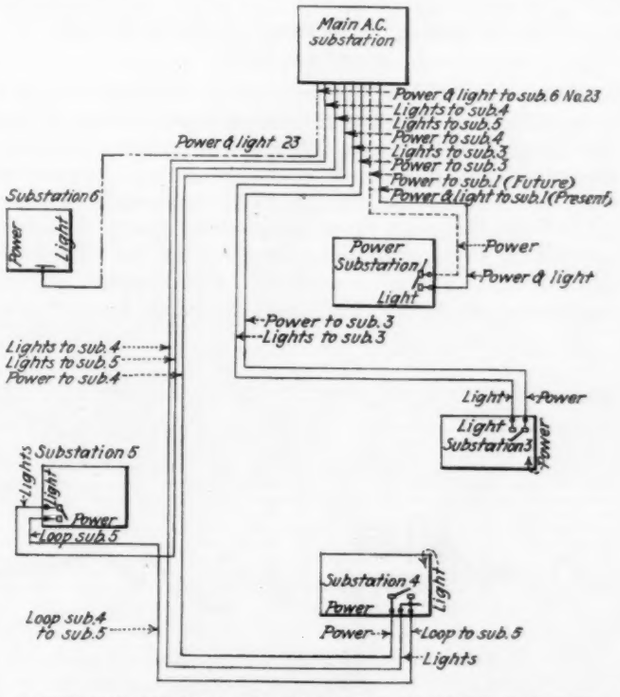
THE Miller Rubber Company was among the first of Akron's more than 30 rubber plants to undertake the complete electrification of its mill machinery for the handling of the raw rubber and its processing through various steps to the finished products. On about 35 acres of floor space in Akron alone the company now has 1,600 motors installed varying in type from the earlier direct-current motors to comparatively recent adaptations of the alternating-current slip-ring motor and synchronous motor of 500 r.p.m. and less.

Although by no means possessing the largest size of synchronous motors for mill drives, the Miller company has a representative installation and—in the case of its Kenmore plant—some of the latest developments in the industry. Both steam and gas engines were used originally as direct sources of power for nearly all operations in the plant. Later the management determined that increased economies in operation could be secured by electrical operation, and in 1910 the first motors were installed. As further additions were made to the existing electrical equipment a substation consisting of six 2,000-kw. transformers, together with the necessary switching equipment, was erected and two 750-kw. synchronous motor-generator sets were installed to replace inadequate rotary converters. The early installation of electric main mill drives had given very satisfactory operating results and the greater economies obtained reduced the costs per ton of handling rubber considerably.

### Distribution Facilities

An outdoor switching and transformer substation, installed and maintained by the Miller company on its own premises, receives 22,000-volt, three-phase, 60-cycle power from the Northern Ohio Power & Light Company, the voltage being stepped down for each of five distribution substations to 2,200 volts. At present the transformer capacity of the main substation is 12,000 kva., but there are ample facilities for increasing this to meet additional plant demand as it develops. It is estimated that the maximum demand is at present approximately 8,100 kw. and that the annual energy consumption is about 32,190,000 kw.-hr.

Three-conductor underground cable (200,000 to 300,000 circ.mil in cross-section) ties in the main substation with the five distribution stations. The equipment of each of these latter points consists essentially of three delta-connected 2,200/440-volt power transformers and single-phase lighting-service transformers 2,200 to 220/110 volts. Provision has been made through duplication of the three-phase feeder services to guard against interruptions of power supply. All oil circuit breakers, except the main breakers and those on small machine panel installations, are of General Electric manufacture, hand operated, and are mounted in brick compartments with transite board partitions between phases for isolation. The main incoming power breakers on 22,000 volts are 300-amp., Westinghouse type O-1 and are mounted with wall brackets. All of the oil circuit breakers are arranged with protective overload relays and with disconnects. The diagram showing the main power circuits of the switching and metering system is of interest because of the adoption of a double-bus scheme of connection, which permits uninterrupted operation and the cutting out of any part of the system for maintenance or inspection.

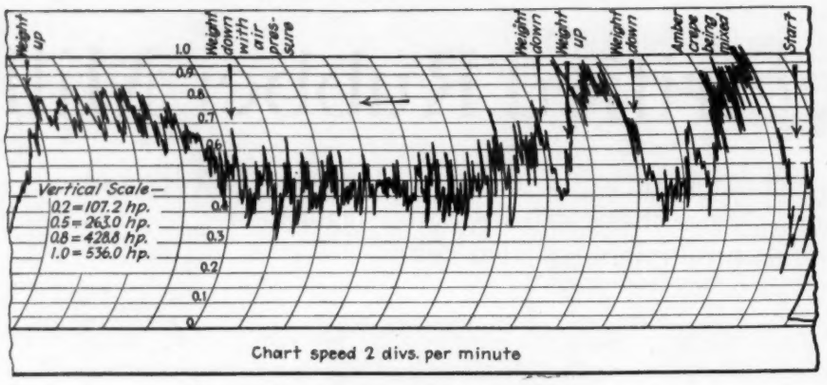



SUBSTATION POWER AND LIGHT FEEDERS ARE LOOPED TO ASSURE SERVICE CONTINUITY

In order to comprehend properly the cycle of duties to which the various types of motors are being put in this plant some outline of the processing of the rubber from its raw to finished state is necessary. Although rubber manufacture is said to divide itself into about thirteen well-defined classes, there are certain basic processes that all companies use—washing and mixing, for

TABLE I—LARGE SIZE MOTORS EMPLOYED IN THE MILLER RUBBER PLANT

| No. | Hp | Equipment Driven by Motors |
|---|---|---|
| 2 | 1,100 | Drive 750-kw. motor-generator sets |
| 8 | 350 | Used on 60-in. mill drives |
| 6 | 500 | Used on 84-in. mill drives |
| 3 | 400 | Used on 60-in. mill and wash lines |
| 2 | 600 | Used on 84-in. masticating mills and Banbury mixers |




1. TYPICAL LOAD CHART OF A BANBURY MIXER

Note that each tenth graduation on scale represents an equivalent horsepower demand of 53.6. (1) Start of mixing batch; (2) weight of piston down on batch; (3) weight of piston up; (4) weight of piston down; (5) air pressure added to weight; (6) pressure removed —batch mixed.

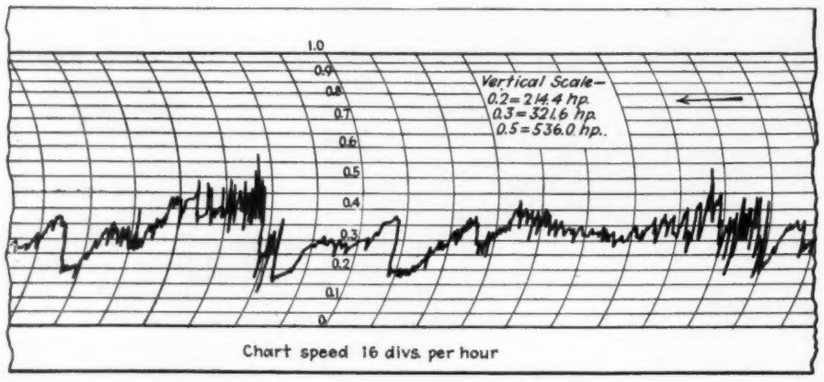
example. It is toward these latter operations and the part rubber-mill electrification plays that attention will be directed.

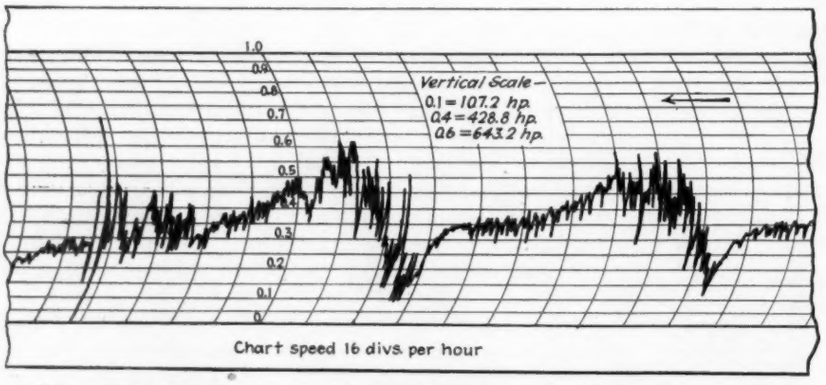
## Two Important Processes in Crude Rubber Manufacture

*Handling of Crude Rubber.*—Crude rubber comes in a great variety of forms—balls, strips, lumps, flakes, sheets and all conditions of scrap. Even with plantation rubber there is always more or less foreign matter, acquired in shipping or otherwise, that must be removed before the rubber can be used in manufacturing goods. Consequently the primary process, whatever the line of rubber manufacture, is that of washing. Roll washers consist essentially of heavy iron rolls running toward one another, facilities for spraying hot or cold water over the rubber as it passes between the moving rolls, and with sieve bottoms to save scraps, and guides between rolls to keep the rubber from working into the bearings. These rolls are corrugated or fluted so as to bite the slippery gum and draw it between them. As the rubber passes through the rollers, a stream of water from a perforated pipe is directed on it and in this way particles of foreign matter are washed out, the rubber itself being broken down into fragments that cohere to form a continuous sheet with a crêpe-like surface. After passing through these mills several times the crêpe is hung up to dry in a chamber that is heated to a temperature of between 110 and 170 deg. F., and in an atmosphere that is usually at a relative humidity of 20 to 60 per cent.

*Milling.*—The washed and dried rubber (in cases where this is necessary) or the rubber as received at the factory is then submitted to the first operation incidental to the manufacture of rubber articles—namely, mastication, or breaking down—the object being to make the rubber plastic in order that the sulphur and other necessary ingredients may be readily incorporated. The milling is commonly performed by passing the rubber between iron rollers that revolve slowly in opposite directions and at different speeds. Heat is generated in the process of forcing the rubber between these rolls, and in order to prevent overheating they are cooled by means of a stream of water passing continuously through their interiors. The rubber so treated gradually becomes plastic and eventually forms a continuous sheet, which adheres to one of the rolls. During the process the machine operator continually cuts away portions from the sides of the sheet and replaces these in another part of the roll, thus insuring the production of a homogeneous mass.

The subsequent treatment of this milled or masticated rubber depends on the type of article to be produced and the method of vulcanization to be employed. It may consist of making it into a dough or solution, if a proofed cloth is wanted; calendering, where a rubber sheet of uniform thickness is desired; or forcing through a die to give a tube or solid strip.




2 AND 3. LOAD CHARTS OF MILL LINE CONTAINING FIVE 60-IN. UNITS OPERATING

Upper graphs show how evenly the loading of the mill line is distributed during the day shift.

The lower one shows how the batches were started at approximately the same time on the second shift, in this way causing unnecessarily high peak loads on the motor for quite an appreciable length of time. Points where the safety was tripped are apparent because of the high momentary surge caused by the brake acting before the clutch releases.

## Motor Characteristics

In considering the power and speed requirements of the different machines in the rubber mill it is obvious that the mills for working up the rubber and mixing it to form the various compounds call for extreme overloads, which are, however, of short duration. By grouping such mills and driving them from a single motor the load peaks have been so staggered as to be considerably reduced in total. Instead of the maximum value of overload being 300 per cent of the average, it has

been found that this can be reduced to 150 per cent or less by driving with a single motor a group of six to eight mills used for masticating, mixing and warming. Moreover, this fact has permitted the installation of synchronous motors, which, in addition to helping correct the power factor of the plant load, have made unnecessary the use of clutches for starting duty. The synchronous motor, in starting, is thrown in series with a compensator directly across the line, brought up to speed and synchronized through the automatic action of field-circuit relays. Direct-current motors are sometimes used when this is the power available, but they are more expensive and except for operating calender machines are universally discarded in favor of the synchronous units, which in recent design have made considerable strides.

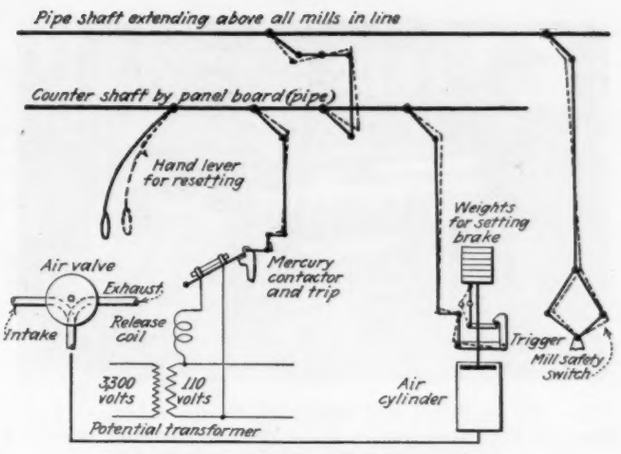
## Calenders

Calenders require a particularly close speed control over a range of about four to one and use direct-current equipment almost exclusively. The power required to drive a calender varies over a wide range, as is indicated by the accompanying graphs, and depends upon the character of the compound, its thickness, width and the rate of travel of the material through the rolls. The speed is limited to that at which the compound can be run without blistering or the forming of a rough surface. When the calender is started up with cold rolls, the permissible speed is higher than after the rolls become heated. A fine speed graduation is necessary, therefore, to maintain a maximum output. The torque required depends upon the thickness of the sheet and the material, and there are so many combinations possible together with the speed requirements that it is difficult to formulate any rule to determine the power needed.

The commonest means of changing the speed of a calender motor drive is by varying the field strength through insertion of resistance while at the same time supplying the armature with a variable voltage secured by the addition of adjustable resistance values in its circuit. With the more recent general application of commutating pole motors to calender drive a greater speed range is possible with constant armature voltage and varying field strength. This latter method results in the simplest equipment as a whole. The motor must be larger, but the control can be made exceedingly simple and in a great degree automatic.

## Motor Control

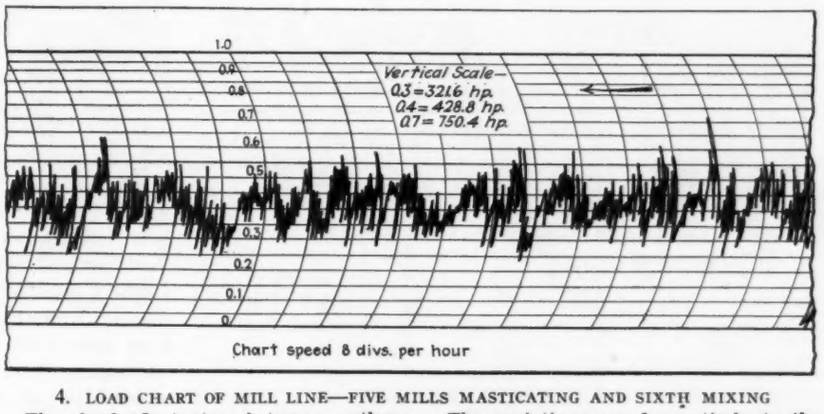
As the motors that drive the mills are operated at a constant speed, only starting devices are required. The type of control used enables the operator to bring the calender up to speed by moving the controller handle around through several resistance steps to obtain the desired speed. Automatic acceleration is provided to limit the current inrush, whereas in stopping dynamic braking is employed. This is to provide a safe condition for the operator in the event his hands or even




SAFETY-ROD MOTOR CONTROL SYSTEM

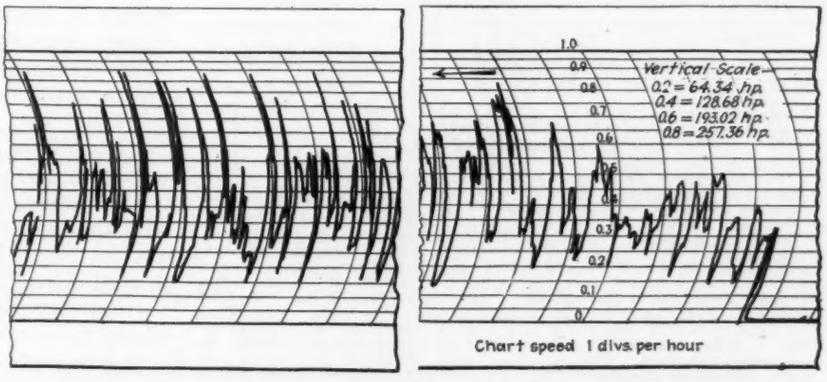
his body (as has been known to happen) should be caught and dragged between the rolls. Means are provided in all cases for reversing the direction of rotation of the motor to assist in manipulating the calender. The control includes overload and low-voltage releases and is so designed as to be immune from damage to itself or the motor should the operator fail to perform control operations in the proper sequence. A safety stop device as outlined in an accompanying sketch and consisting of an overhead throw-out rod within easy reach on every machine can be operated by the hand, the foot or even the head or shoulders of the operator.

All motors of 100 hp. or over are operated on 2,200



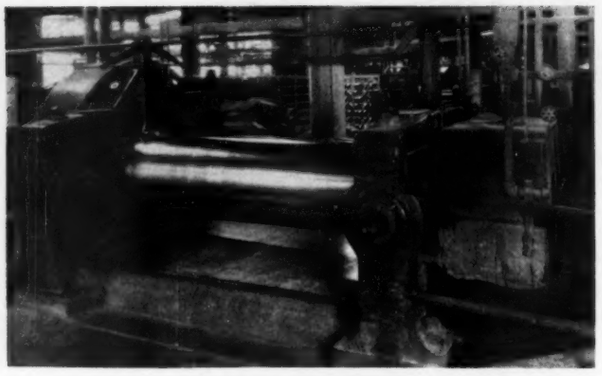

4. LOAD CHART OF MILL LINE—FIVE MILLS MASTICATING AND SIXTH MIXING

The load fluctuates between rather great extremes; although the high peaks are only momentary they occur quite frequently. The variations are due entirely to the feeding of the mills. The cracker mill takes more power than any other single mill on the line.




5. LOAD CHART OF SIX MILLS—FIVE WASHING STOCK AND SIXTH CRACKING THE RUBBER

Test No. 1—Washing stock on five mills (1,500 lb. on three mills, 900 lb. on one mill); cracking stock 900 lb. on one mill; rolls 40 in. long. Test No. 2—Cracker not on at start of test, which accounts partly for low readings, also No. 1,500 stock being used on all of the five mills in operation at time of test.

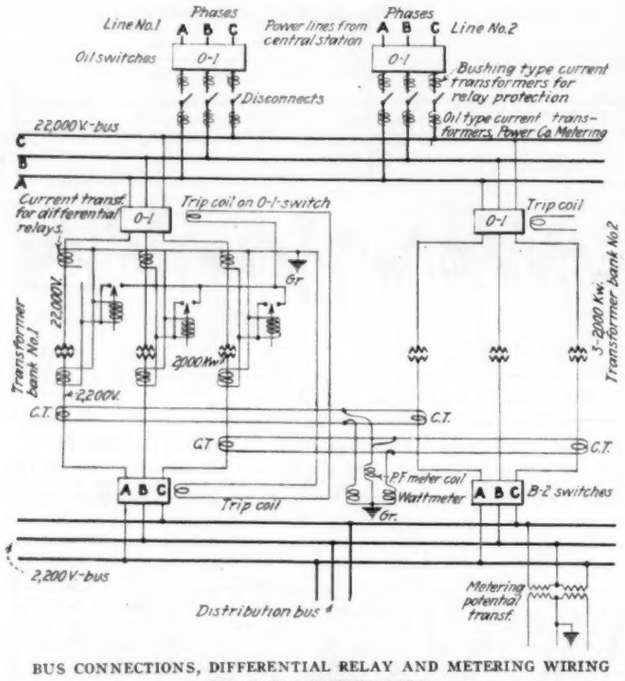


AN 84-IN. MILL DRIVEN BY 500-HP. MOTOR
Pipes for circulating chilled water from refrigerating plant and guarded bull wheel and gears are shown

volts, and smaller motors, with the exception of fractional horsepower units, are connected directly to 440-volt mains.

As a part of its rubber manufacturing facilities the Miller company plant has a refrigerating system with a capacity of 900 tons of refrigeration, or 750 tons of ice each 24 hours. The plant consists of three separate units, two of which are driven with 350-hp., 2,200-volt slip-ring motors connected through a rope drive to the compressors. The third unit has a synchronous motor direct connected. Five 2,000-g.p.m. and two 1,000-g.p.m. pumps handle the refrigerated water and the operation of the system.

The Sessions Engineering Company of Chicago assisted in the design of the main alternating-current substation, the direct-current substation and the several small distribution substations in the plant, also in laying out the underground cable system. The Miller Rubber Company handled all of its own construction work.




BUS CONNECTIONS, DIFFERENTIAL RELAY AND METERING WIRING IN AKRON RUBBER MILL

The two power lines shown operate either in parallel or individually and are metered in either condition and through either transformer bank with only one set of meters, consisting of a recording kilowatt meter and recording power factor meter. When both current transformers of the same phase are energized, they combine additively and their total passes through the current coil of the meter. When metering either bank separately, the high impedance of the current transformer in the dead line stops all the current from the current transformer on the hot line, and consequently it takes the easier path through the meter coil. This has been carefully checked and found to create so small an error that it is not necessary to take care of any correction factor in totalizing the load. This scheme keeps the total record on one chart and saves purchasing two meters with the additional maintenance involved. The differential relay protection between the high- and low-voltage sides of the power transformers is also shown. By this protection only one phase overload trip coil is left for protection with standard two coil switches. Although not exactly preferable, the line switch ahead is fully protected so that there is no danger of not clearing the line in case of trouble.

# Features of Four-Party Agreement on Jointly Owned Plant

By E. J. Fowler
Statistician Commonwealth Edison Company

*Now under construction at Pekin, on the Illinois River a few miles south of Peoria, is the Powerton plant of the Super-Power Company of Illinois. Control of this company is shared, through ownership of its common stock, by the Commonwealth Edison Company, the Public Service Company of Northern Illinois, the Illinois Power & Light Corporation and the Central Illinois Public Service Company.*

THE four-party agreement under which the Powerton station at Pekin, Ill., will go into operation (probably during the late summer of 1928) has some very interesting features. Chief among these is the entire elimination of consideration of demand as a factor in the determination of charges to the buying companies. This is accomplished by definite assignments of plant capacity to the four companies and the payment by them of all plant fixed charges in proportion to their assignments. The secondary, or energy, charge will be the actual generation cost per kilowatt-hour with slight upward or downward adjustment for lower or higher load factors.

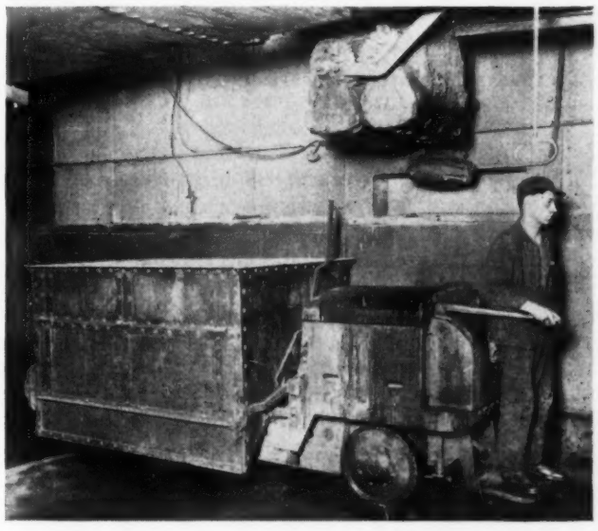
The initial capacity of 52,000 kw. will be split four ways, 15,500 kw. each going to the Commonwealth Edison Company and the Public Service Company of Northern Illinois, 16,000 kw. to the Illinois Power & Light Corporation and 5,000 kw. to the Central Illinois Public Service Company. The first three will therefore bear approximately 30 per cent each of the fixed charges, including interest, depreciation and taxes, and the fourth about 10 per cent. The agreement provides for reallotment of capacity whenever conditions arise in which one company desires to increase or decrease its share and the others, or any one of them, are, or is, willing to release or absorb the capacity in question. If for any reason, such as overhauling or breakdown, the capacity of the station is reduced, the allotments of all four companies are decreased in proportion to the station reduction.

Probably the most important feature of the agreement is that any company may take unused capacity according to the requirements of its own system by arrangement with the system load supervisors or dispatchers without any increase of primary payment. Capacity so appropriated is available on demand by the company in whose share that capacity belongs. For instance, the companies whose territories are nearest to the plant—the Illinois Power & Light Corporation and the Central Illinois Public Service Company—will not normally use their allotted capacities from midnight to 7 or 8 in the morning because of the character of their system loads. However, it might be possible for either the Commonwealth Edison

Company or the Public Service Company of Northern Illinois to effect economies in generation or transmission costs by taking increased amounts of energy from the Powerton station during those hours. Thus, so far as the agreement is concerned and if it is practicable from load and operating standpoints, these companies might take off-peak, or dump, power to such an extent that the load factors of their purchases, based on their allotted capacity, may go well over 100 per cent.

## Ash Handling with Industrial Electric Trucks

THE removal of ashes from beneath the boilers at the New York Edison Company's power station, Waterside No. 2, when the station was first placed in service, was accomplished by electric mine locomotives and dump cars, running on a narrow-gage track. The



ELECTRIC TRUCK MINIMIZES LABOR OF ASH HANDLING

disadvantages of this method were that the track took up valuable floor space and required turntables at aisle intersections, affording limited flexibility.

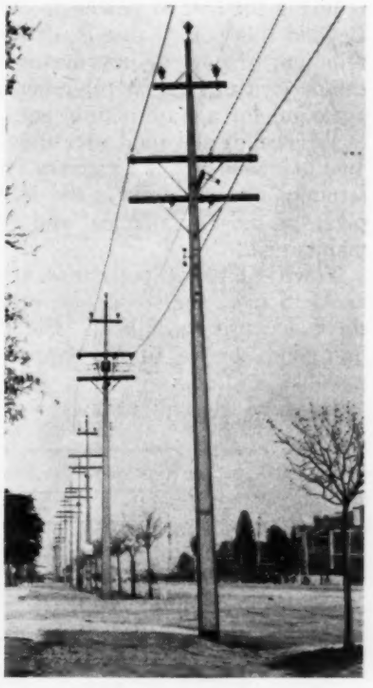
In searching for new means of carrying on this important work, it was decided to do away with the mine locomotives, dump cars and tracks and substitute 3-ton elevating platform electric industrial trucks. The hopper bodies are run directly beneath the ash chute and when filled are quickly taken away to the dumping bin. About 10,000 cu.yd. of ashes is removed per month. Although two trucks can normally carry on the work, a third is held in reserve for emergency.

The total cost of the trucks was very much less than the estimated cost of replacing the mine locomotives, tracks and dump car equipment and the flexibility of handling was improved.

## Fabricated Pole Requires No Skilled Labor

STEEL-CONCRETE poles for transmission lines have been developed for use in Australia in an endeavor to produce a pole that is strong, cheap and readily assembled.

The poles consist essentially of two standard rolled steel channel sections, which form the basis for the pole construction and may be shipped in quantities to the field and when bolted together filled with a mixture of concrete, stone and sand. This gives a product much lighter than a reinforced concrete pole of equivalent strength and but slightly heavier than wood poles. It may be handled and transported with the same facility and freedom from breakage as the wooden poles and in the installations in some places in Australia has been dragged into position over rough country without damage.



TYPICAL TRANSMISSION LINE SUPPORTED BY STEEL-CONCRETE POLES

Numbers of these poles have been tested to destruction and it has been found that they fail by stretching the steel in the tension members instead of through the collapse of the compressed member, as is usual in steel structures. This is due, it is said, to the great support the concrete gives to the compressed member. A pole that has failed in the sense that the tensile strength has been exceeded and the concrete has cracked badly does not collapse but still resists further deflection with a very considerable proportion of its original strength. Poles up to 99 ft. in length have been erected for supporting floodlights in railroad yards and up to 50 ft. long for transmission line work. Angle poles for 45-ft. lines unsupported by guys have been constructed.

The cost of manufacture is said to be very low, as only a punching machine, a concrete mixer and a few forms are required. Unskilled labor is used, and on long lines the poles are manufactured at convenient points along the route. More than 200 miles of 33,000- and 66,000-volt lines have been erected in South Australia with an average spacing of ten per mile. This innovation in pole practice is the result of the work of J. B. Stobie of Adelaide, South Australia.

| Material List for One 42' Pole | | | |
|---|---|---|---|
| No. | Member | Weight | Remarks |
| 2 | 4¾"x1¾ Channel sections | 546 lb. | Punched and set |
| 25 | ⅝" bolts and nuts | 25 lb. | Length as shown |
| | Concrete 1:2:4 mixture | 1650 lb. | |
| | Total weight 2220 lb. | | |

STEEL-CONCRETE POLE WHICH PERMITS SERVICE TO REMOTE DISTRICTS OTHERWISE ECONOMICALLY UNSUPPLIABLE

# Reducing Distribution Loss—I

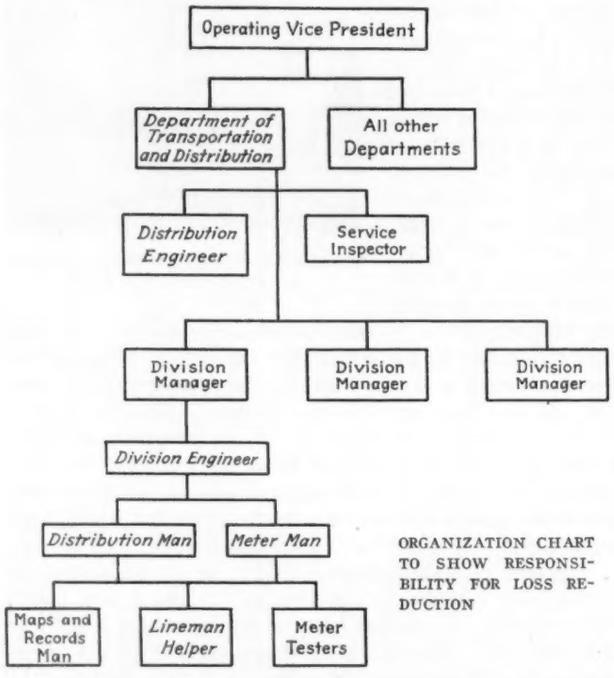
## Beginning of a series of practical methods for getting the most out of efficiently generated power on its way to utilization equipment

By J. B. Moorhouse
Electric Distribution Engineer
Central Illinois Public Service Company, Springfield, Ill.

THE rapid increase in demand for electrical energy has caused construction and operation to overshadow the problem of minimizing losses. Electric utility companies have been able to meet the demand for power by building larger and more efficient power plants, thereby reducing the cost of power production at the station bus. Beyond this point—that is, in the transmission and distribution of power—improvement has been less rapid in the majority of cases. Overhead and underground construction for a transmission and distribution system is a large part of the total investment of an electric utility. Just as much care is necessary in the design of this construction as is required in the design of an efficient power plant, if most economical and efficient service is to be maintained.

Towns of 10,000 population and larger present an easy problem from the standpoint of distribution loss, due to the concentration of load. For the same reason providing good service in the larger towns is economically possible.

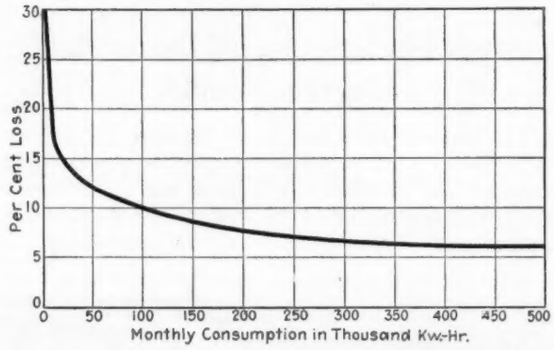
In some electric utilities the operating departments




ORGANIZATION CHART TO SHOW RESPONSIBILITY FOR LOSS REDUCTION

may point with pride to line loss reports showing apparently reasonably low losses. These reports are reflections of good operation and show that energy supplied to the system is being used economically and being accounted for properly. But the cost of lost energy may be shown to be an important item. As an example, let us assume that a transmission system serving 100 average communities with electric service will require annually 150,000,000 kw.-hr. of energy. Of this amount 30,000,000 will be charged off as unaccounted-for losses, making a loss of 20 per cent. If by redesign, reconstruction and better operation of the system the losses can be cut from 20 per cent to 17 per cent, there will be effected an annual saving of 4,500,000 kw.-hr. Assuming the cost of producion of this energy to be $0.008 per kilowatt-hour, the annual saving will be $36,000. Considering this from the financial viewpoint, sufficient funds should be available for carrying out the necessary reconstruction work to bring about the saving.

The unaccounted-for loss problem facing the manager




USUAL DISTRIBUTION LOSSES AGAINST KILOWATT-HOUR CONSUMPTION

of an industrial plant is different from that of an electric utility only in that it covers less territory. The actual investigation and reconstruction work involved is usually readily worked out and completed with less time and expense than that involved in the electrical utility.

The problem of reducing unaccounted-for losses should be undertaken in a systematic manner. An organization chart of a transmission line company is shown here in part. The positions actively connected with reducing losses are shown in italics. In order that all persons connected with loss reduction may know what results are to be expected in each town, a curve showing the per cent loss to be expected when the monthly consumption in kilowatt-hours is known is here reproduced. Special conditions in certain towns must, of course, be taken into consideration. In preparing the chart a study was made of loss reports from 200 towns varying in consumption from 2,000 kw.-hr. to 500,000 kw.-hr. per month.

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# Camera Records of Construction Work

A PHOTOGRAPHIC record of all construction work is kept in the office of the superintendent of the Fulton Light, Heat & Power Company, Fulton, N. Y. Views are snapped previously to undertaking any work involving new construction, alteration, repair or improvements. Upon completion of the job photographs are again taken of the location as it then appears. Each set of pictures is numbered with the work order number and kept in a specially prepared album for permanent record.

This plan was devised to refute any possible argument as to the condition of equipment, property, line conductors or structures previously to the initiation of the work and has enabled this company to avoid litigation in several instances. In addition to serving the purpose for which it was intended, the visual records have proved almost invaluable to the operating department in enabling it to refer to the condition of plant equipment at any time without actual investigation of the particular locality or apparatus and to indicate clearly the improvements that are concurrently made in local construction practice.

## Interconnection and Consolidation Effect

# Vast Benefits to Consumer*

**Technical economies of interconnection have steadily lowered costs and increased output, with consequent benefits of huge importance to investors and customers alike**

By SAMUEL INSULL

*President Commonwealth Edison Company, Chicago, Ill.*

IN THE last year the desirability of large aggregations of electric power has been questioned. There is no evil in mere size. It is the reason for the size and the effect of it—the disposition and the purpose of it—that counts. The growth of the electric light and power industry has been as natural and understandable as the growth of a tree, and as devoid of sinister implications and consequences.

The development that has given electric light and power the size and importance and prominence of today . . . has come within 25 years. This development, wherever coal is the prime source of power, began with the introduction of the steam turbine for generating purposes. The turbine stimulated long-distance transmission for a very simple reason. It reduced the initial production cost of electrical energy, wherever the steam engine was the prime mover. With a less costly product to be transmitted, the inevitable losses of energy in transit became of less consequence. The electric company was thus encouraged to experiment with transmission, and could transmit farther, as reduced production cost gave it a margin to go on.

Probably in the future, as in the past, at least two-thirds of all central-station power used will be generated by steam. This proportion of steam production may be increased by the increased economy of steam-driven prime movers and the cost of long-distance transmission. It is therefore apparent that development of the increased efficiency of the steam turbine has materially affected the economic advantage of hydro-electric power.

Interconnection, "superpower," group management and all the rest of it, have followed low-cost steam generation and distance transmission as naturally as day follows dawn. Neither financial hocus-pocus nor malign ambition for control—for "getting a stranglehold on the public," as it is sometimes phrased—has ever been a factor in this development. It has come in a logical succession of economic steps, often hesitant and faltering steps.

SAMUEL INSULL

Perhaps I can illustrate its beginnings in this part of the country, and so indicate the consequences, by a brief reference to an experiment in centralized production and distance transmission that was made in Lake County, Illinois, seventeen years ago. It was on a very small scale, according to present-day practice, but it contained the germs of all those features of electrical development that are most conspicuous today.

We selected for this experiment in 1910 a group of 22 little towns well back from the lake shore suburban area, with populations of 300 and up. It was probably the poorest prospect for centralized electrical operation in all of my subsequent experience. Ten of these towns had electric service of a sort, but only at night, locally supplied by little plants that were one jump ahead of the sheriff. The twelve other towns and the intervening farms had no electric service whatsoever. We bought the little plants of the ten night-service towns. We then built transmission lines, centralized the production of current for the territory in one plant near Lake Michigan and shut down the little plants. Now, mark the results in service.

Within two years all but two of those little villages and towns, and 125 farms, were getting full 24-hour electric service; 24-hour service for the ten towns that previously had only night service; 24-hour service for the ten towns and 125 farms that previously had no service whatsoever.

Equally revolutionary was the financial significance of this inauguration of centralized production and distance transmission to serve groups of communities outside of

**Excerpts from address before the Electric Association, Chicago, Nov. 17, 1927.*

large cities. It cost a good deal, relatively, to abandon the ten small town plants and centralize all production in one plant and to build transmission lines and local substations for distribution of energy. By this necessary increase in capital account the investment charge per kilowatt of maximum demand on the system was practically doubled. Superficially this would seem to have made the experiment economically hopeless. But now mark the operating and financial results of centralized production and distance transmission.

While the investment charge per kilowatt of maximum demand on the system was practically doubled, the increased use and the diversified use of energy were so stimulated by the better service, and the output was so increased, that fixed charges per kilowatt-hour of output were only slightly affected. And this slight increase in fixed charges per kilowatt-hour was more than offset by other gains as follows: The operating load factor of the new system was improved about 100 per cent; the fuel cost per kilowatt-hour of output was reduced 70 per cent; other operating costs were reduced about 84 per cent, and the total cost per kilowatt-hour of output was reduced practically 60 per cent. The net results of this experiment, therefore, were: 24-hour service instead of night service for a population of about 14,000 people; 24-hour service instead of none at all for a village and farm population of 8,000 or 9,000 people, all at lower rates than any part of the territory had previously enjoyed, and also the establishment of financial credit for further development that would have been impossible under previous conditions.

### Results Duplicated Elsewhere

What was done in Lake County is exactly what has been done throughout the country in recent years on an immensely larger scale, and generally speaking, the operating results and the benefits to users of the service have been identical, assisted, of course, by coincident improvements in the art. The main items in this development have been as follows:

A grouping of communities for centralized economical production of energy.

Small and uneconomical plants shut down.

Volume of output increased, and use of it broadened, with consequent reductions in operating costs and in rates to users.

Then interconnection between the group systems, high-voltage long-distance transmission, and finally "super-power," with results from this grouping of systems that are entirely comparable to results from the original grouping of little communities in Lake County.

Hostile reaction from the outside to this development, wherever it exists today, is identical in principle with that which attended the Lake County experiment. Certain financial writers said then that we were "putting together a lot of junk" to be unloaded on the investing public. But the results fully justified what was done in Lake County, as results now justify, and will continue to justify, the grouping and interconnecting of the present day. No investor lost a penny by the acquisition of the "junk" in Lake County, and users of the service had nothing but profit from it.

The critics seem unable to realize that, in this grouping and interconnecting development, it is often economically justifiable to pay apparently too much for some of the properties to be grouped. In my original Lake County experiment I apparently did that very thing. When properties are necessary to round out and complete a group situation, the price paid for them, if anywhere within reason, is relatively unimportant. The advantages accruing from compact grouping will soon amortize any difference between tangible value and purchase price.

The development germinated in Lake County has not come quickly. Skeptics within as well as outside of the industry retarded but did not stop it. The Lake County experiment was repeated in other parts of Illinois on a larger scale. Then we began to see the picture in terms of wide territorial development, even to include an entire state in one system.

### What Happened in Central Illinois

Central Illinois concretely illustrates practically all that I have indicated in relation to this grouping of communities, interconnection and centralized operation. Of the 320 communities [served by the Central Illinois Public Service Company] 174 had no electrical service before this company supplied them; they were too small to support isolated plants. Of the 146 other communities (including 31 with municipal plants) only 51 had anything that could be called 24-hour service. All of them now have 24-hour service comparable in quality to that of large cities and at rates that are less than any of them had before a centralized policy was adopted.

In achieving these results 83 small and uneconomical plants have been shut down to centralize production in larger stations. In 1926 more than four times as much service was supplied as in 1918, on about the same consumption of coal. In 1926 about sixteen times as much electricity was sold as in 1913, but the revenue from this source was only five times greater, although the cost of coal and labor had been practically doubled. Mass production and centralized operation produced the savings and the customers got lower rates.

This Central Illinois company also illustrates the helpful part played by the "holding" company, or better still, the investment company, in present-day development—a helpfulness that was emphasized by war-time conditions. The local company was headed for the rocks under the mounting costs, inadequate rates and restricted credit of war time. It was carried by the investment company that owned its common stock until the end of the war gave it a chance to get on its feet and became both highly serviceaole to its public and financially satisfactory to its security holders.

Long-distance transmission has likewise expanded. It was made economically possible for steam users by the steam turbine and was stimulated by turbine improvement. As larger and better turbines reduced steam-generating cost still more, farther and farther transmission became feasible, assisted, of course, by improvement in transmission facilities and methods.

The comparatively few miles of transmission line of relatively low voltage required for the Lake County experiment has become 125,000 miles of high-tension transmission line in the United States. The pressures employed have risen to 11,000, to 33,000, to 66,000, to 132,000 and more. On a thousand miles of line in the West the voltage is over 200,000.

Fifteen years ago few if any Illinois towns of less than 500 population had central-station service; today more than 500 towns of that size have it. Fifteen years ago there were 180 Illinois towns of more than 500 population that had no central-station service at all; today only a couple of dozen of that size are without it.

I have no figures on this for the whole country, but the Illinois record is at least approximated wherever this development is well advanced.

Fifteen years ago electricity on the farm was prac-

tically unknown, except as an occasional "gentleman farmer" near a city could afford it. Today 325,000 American farms have central-station service as the result of mass production, group management and the financial operations of so-called "holding" or investment companies.

### The Financial Aspects

The quadrupled investment [in the electric power utility industry], which is represented by securities issued, points to a financial feature of this development that seems to disturb the critics, probably because they do not understand it.

You will recall my reference to the greatly increased capital investment required by the Lake County experiment. It practically doubled the investment charge per kilowatt of maximum demand. But this increase in fixed charges was more than offset by the savings of centralized operation and the gains from increased output and diversified use of output, so that final costs, and, consequently, rates, were reduced.

The same thing has happened in the larger development, all the way up to "superpower," only more so. The increased capital needs have been relatively a more acute problem in the larger development, and for perfectly plain reasons, as I shall try to show. Research and experiment for turbine improvement, transmission improvement and other aids to efficiency were very expensive. It had to be added to the natural increase in capital investment, as indicated in Lake County. Development and consequent demand for more research and experiment came with a rush. To keep up with development, companies had to scrap apparatus and equipment, as obsolete, before it was half worn out.

Capital requirements increased faster than revenues did. The mounting fixed charges would eventually have swallowed up all of the revenue and would have wiped out the return to the investor, if they had not been offset by gains from lower operating costs and increased output.

But the point is this: The mounting fixed charges have been more than counterbalanced and the downward trend of rates has been continued by the results of centralized operation—namely, lower operating costs, more diversified use of the output and increased volume of output due to the organized selling of it to more and more customers, for a greater variety of uses. And all of these results, which have kept the business financially healthy and constantly more economically useful, have been due to electric light and power management. They are products of the energy and brains and sincerity of purpose that have been put into management by the company commanders and their lieutenants.

*INTERCONNECTION, "superpower," group management and all the rest of it, have followed low-cost steam generation and distance transmission as naturally as day follows dawn. Neither financial hocus-pocus nor malign ambition for control—for "getting a stranglehold on the public," as it is sometimes phrased—has ever been a factor in this development. It has come in a logical succession of economic steps. . . . Mounting fixed charges have been more than counterbalanced, and the downward trend of rates has been continued by the results of centralized operation—namely, lower operating costs, more diversified use of the output and increased volume of output due to the organized selling of it to more and more customers.*

These results, when honestly analyzed, are a complete answer to allegations or insinuations that electric light and power has been dominated by avarice or financial thimble rigging.

It is a business of narrow profit-margin. It is a regulated business, and rightly so. Its revenues, including the revenues of its "holding" or investment companies, have to come out of rates for service, and those rates are everywhere subject to local regulation. It could not gouge the public with excessive rates if it wanted to. That it has never wanted to is clearly evidenced by its record of *constantly increasing service at constantly declining rates.* What industry can show a better record or indeed a comparable one?

If financial adventurers have broken into it here and there—security floaters and manipulators instead of operators—they are only flies on the windowpane. Economic progress will soon wipe out all trace of them.

It is quite true that the industry has enjoyed some favoring circumstances. The chief one has been its relative freedom from government interference. Consequently personal initiative, energy and brains have had their opportunity. The use they have made of it is reflected in the fact that we have, here in the United States, more electric service, available and used by more people and more industries, for a greater variety of purposes and at lower rates, than you can find anywhere else in the world. The industrial and social significance of this cannot be overemphasized.

The causes of our abounding prosperity, of the way we "turned the corner" without upsets after the war, were especially studied by that British Labor delegation that was over here last year. They summed up their conclusions as to the causes of our happy situation in these six words: "Application of electric power to industry."

Just a word on current proposals for harassing or shackling this electrical development by governmental action in one direction or another. It is only history repeating itself. It is off the same piece as the opposition to industrial consolidations 25 or 30 years ago and to railroad mergers in the Hill-Harriman-Morgan era. The railroads are now governmentally advised to consolidate.

Electrical development may be harassed and impeded, but it will not be stopped. Its earning power will not be imperiled. Great as the development has been, the people of this country want, and will insist upon having, more of it. That which they have has been provided in the only way it could be provided, in view of the enormous capital requirements—that is, by massing capital and credit under centralized management to provide facilities for the utmost in economical mass production and distri-

bution and employment of the energy itself. For achieving this massing of capital the "holding," or investment, company and customer ownership are the best expedients yet devised. Economic necessity will continue them until a better way is found.

The "holding," or investment, company not only serves this development by massing capital and credit; it also supplies engineering and managerial skill for making operation efficient in the highest degree. It is a clearing house for information and experience. The things learned in supervision of its various subsidiaries are passed along to all of them. Customer-ownership establishes the closest possible tie between stockholders, management and customers. When users of the service supply a large part of the capital required for providing the service, efficient operation rather than financial manipulation is the chief interest of the management.

With so much said and written about customer ownership, it is strange how the habit persists of referring to central-station managers as if they were the owners. There are approximately 5,000,000 stockholder owners of the public utility industry. We who officer the companies are only the operators.

I and my friends do not own a controlling interest in any of the companies with which I am connected. We are heavily interested in them, of course, as we should be, in proportion to our means. Anyone will do his best work for the business he has put his money into. But the total investment is so large that our holdings are only a negligible percentage of the total. We hold our jobs only while we operate to the satisfaction of the stockholders, most of whom are also customers.

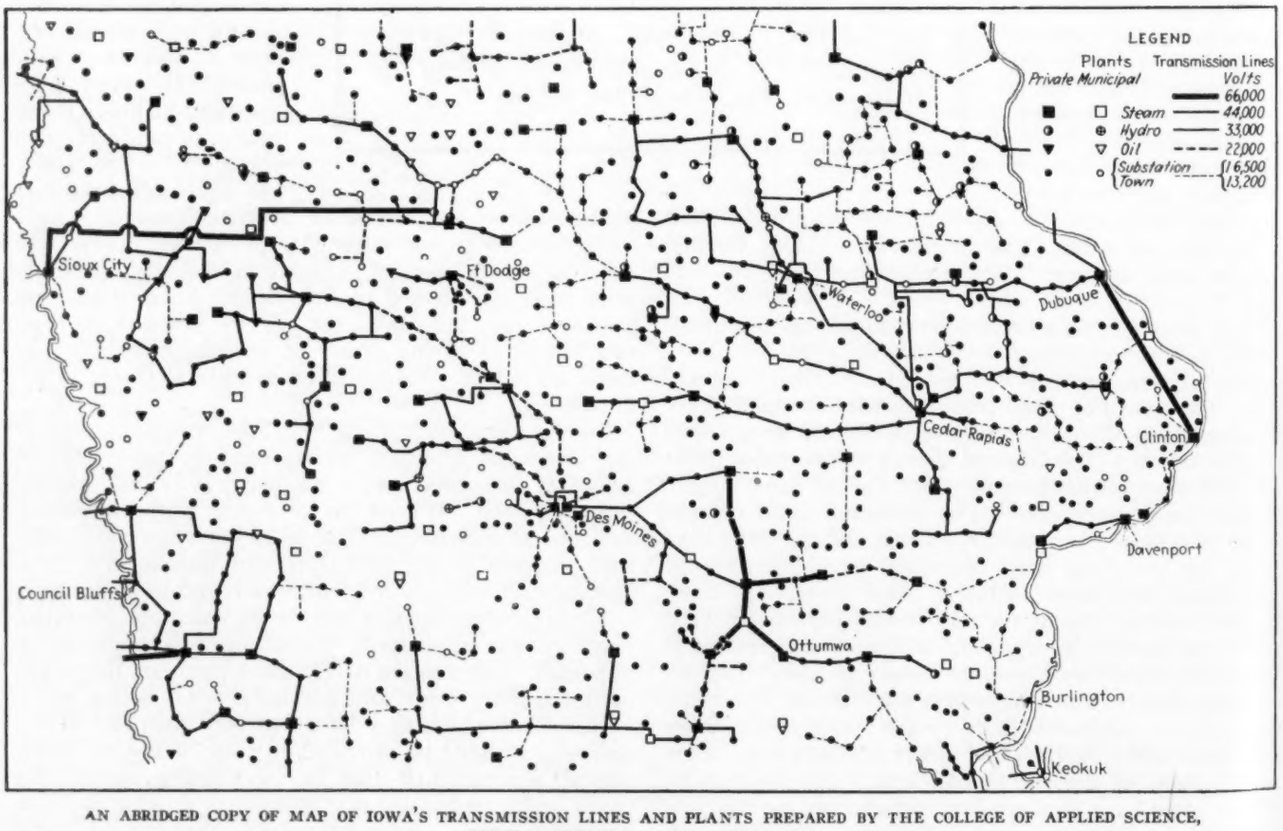
You men who are in branches of the business other than central-station business—you have problems of your own. But the interdependence of the industry makes your problems ours, as it makes our problems yours. Central-station development creates the market for you and keeps it expanding. Development on your side assists our efficiency and facilitates use of our product.

If competition in the sale of turbo-generators or cables or transformers is so keen as to hamper research work and threaten the quality or the rate of development; if too narrow margins restrict the wholesaler's ability to carry adequate stocks, supply sales service and extend credit to the retailer; if the keenness of competition between contractors impairs the adequacy or quality of wiring; if construction is hampered or not properly remunerated on account of policies in other branches of the business—if any of these things happen, the central-station companies, which use those materials and services, finally suffer the most.

And finally, the paramount responsibility, imposed upon all of us by our common interests, is to see to it that no obstacles are placed in the way of general electrical development—a development that is not yet nearly completed but has already done so much to make our country the envy of all the world.

## Iowa's Transmission Lines and Plants

IN THE state of Iowa are approximately 174 corporate and municipal generating stations totaling 460,000 kva. and generating 1,238,000,000 kw.-hr. a year. The 64 municipal plants have a comparatively small rating and output. Under corporate ownership there are 69 steam plants, 30 hydro plants and 13 oil plants; under municipal ownership there are 34 steam plants, 3 hydro plants and 27 oil stations.




AN ABRIDGED COPY OF MAP OF IOWA'S TRANSMISSION LINES AND PLANTS PREPARED BY THE COLLEGE OF APPLIED SCIENCE, STATE UNIVERSITY OF IOWA, IOWA CITY

# Master Control Box Carried by Crane Operator

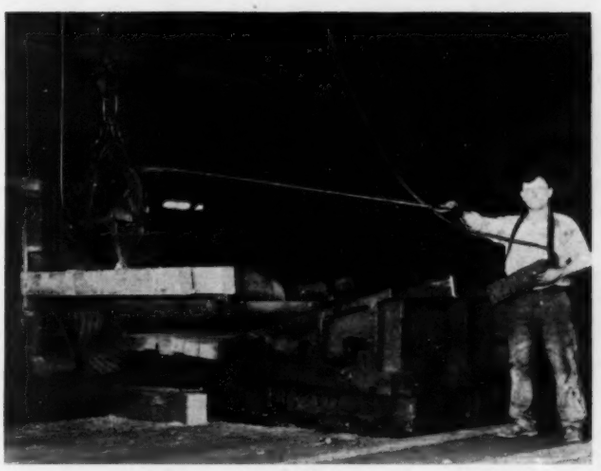
### Portable panel with momentary contact buttons allows one operator to replace eight laborers. Safety features

THE installation of an unusual control device for a crane and lifting magnet has made it possible for one man to accomplish the work that previously required eight laborers in the plant of the Phœnix Iron Company. Steel billets for the rolling mill move slowly through a continuous heating furnace. When a hot billet is taken out of the furnace at the discharge end a cold one is fed in at the other end, and it is the job of this new apparatus to keep the loading platform filled and maintain furnace production.

The equipment consists of a 3-ton overhead crane 60 ft. long spanning the width of the mill building, an automatic control board in the power house, a lifting magnet of the bipolar type specially designed for handling steel billets, and a control box containing a row of push buttons mounted like the bass notes of an accordion and carried by a strap hung around the neck of the operator. A long handle attached to the magnet is an essential feature of this equipment.

One man is crane operator, lifting magnet operator and furnace charger. The carload of billets brought in from storage is placed at the left of the furnace. The operator uses one hand on the keyboard slung across his chest and with the other on the handle attached to the lifting magnet directs the operations. The magnet is turned parallel to the length of the billets and dropped at the midsection. When the magnet is over the loading platform, the billet is dropped so that it is next in line at the heating furnace.

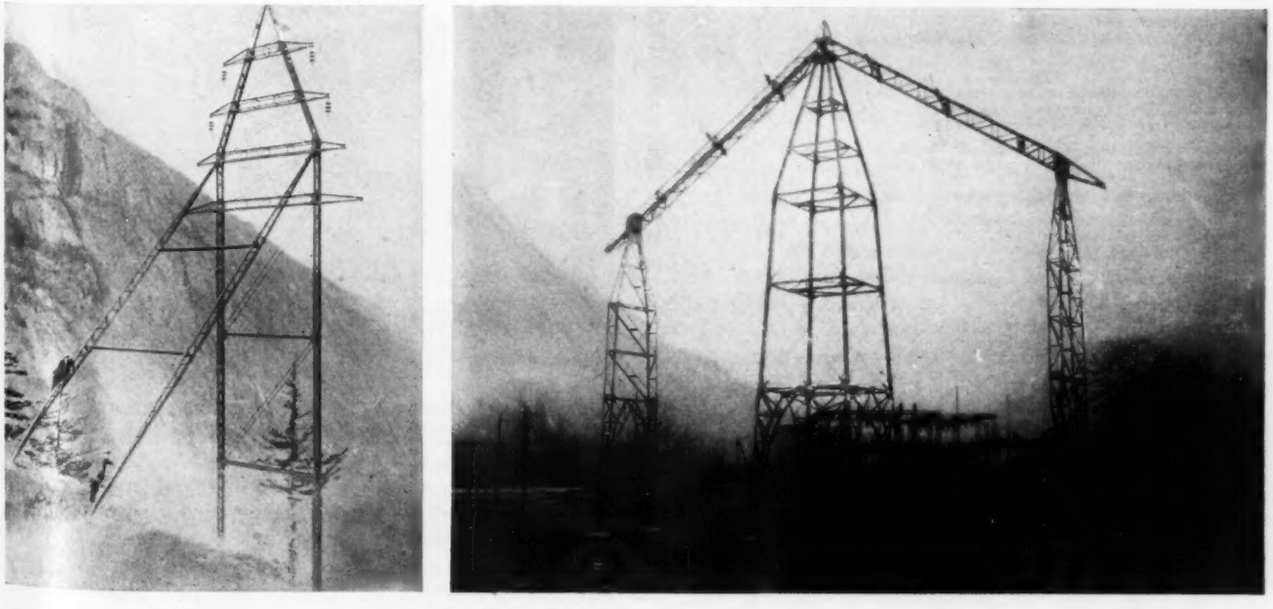
A 2.6-hp. motor drives the crane trolley and a 10-hp. motor is used on the hoist. Control of the crane movements and the magnet is centralized in the line of buttons carried across the operator's chest. Three pairs of push buttons are mounted in this case, one pair for controlling the lifting magnet and the two others for the crane control. For the sake of safety the four buttons that control the crane are momentary contact buttons, making contact only as long as the operator is pressing on them. The corresponding motors are accelerated to full speed by the Electric Controller & Manufacturing Company control board in the power house. The acceleration of both motors of the crane, forward and backward, is handled through this automatic switchboard. The contactor that connects power to the lifting magnet is mounted on the same board.



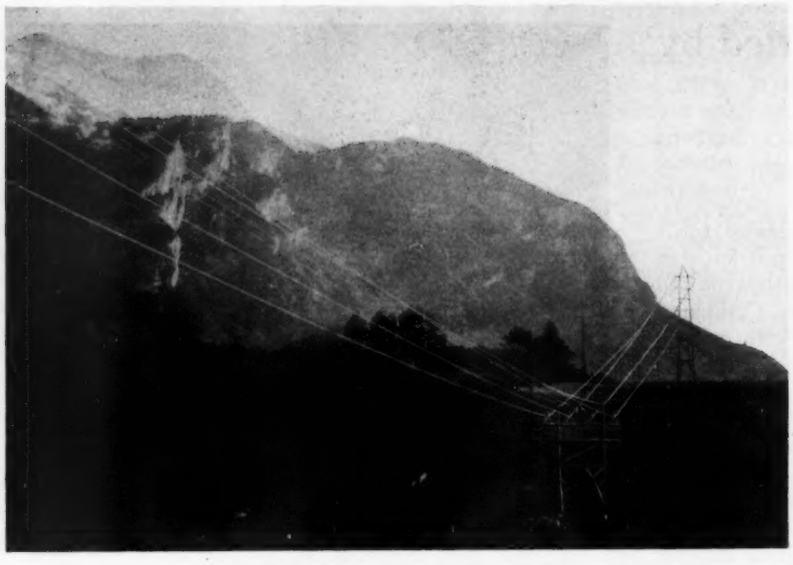
ONE MAN ACCOMPLISHES WORK OF EIGHT LABORERS BY USE OF CRANE, MAGNET AND LOCAL CONTROL BOX

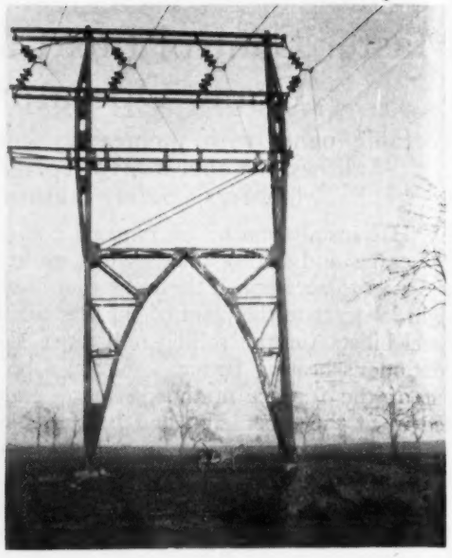
# Unusual Design Displayed in Transmission Towers

THE 66,000-volt lines of the Swiss Federal Railways are supported by transmission towers employing several unusual features of design. The Chatelard-Puidoux line required special provisions because of the sharp grade encountered. The construction used for hillside work leading to the anchor tower near the substation is illustrated. The crossing of the 66/132-kv. service beneath a 50-kv. line shows the Dent de Morcles,



HILLSIDE AND GRADE-TERMINUS TOWERS





TOWER LINE CROSSING AND ANGLE CONSTRUCTION ON 66-KV. PUIDOUX-BUSSIGNY LINE IN SWITZERLAND

and the fortification of St. Maurice in the background. A special angle tower on the Puidoux-Bussigny 66-kv. line effects a crossing under 110-kv. construction.

## Substation Equipment Costs

IN CONNECTION with a recent substation construction job in New England the following items were drawn from the field sheets of the engineering department of the utility that handled the work. The prices quoted in this list did not include installation charges except in the case of twelve current transformers, the total cost of which in place was $4,791.10, labor representing $1,226.21 and engineering $271.19. These expenses were involved in a betterment undertaking to improve relay action.

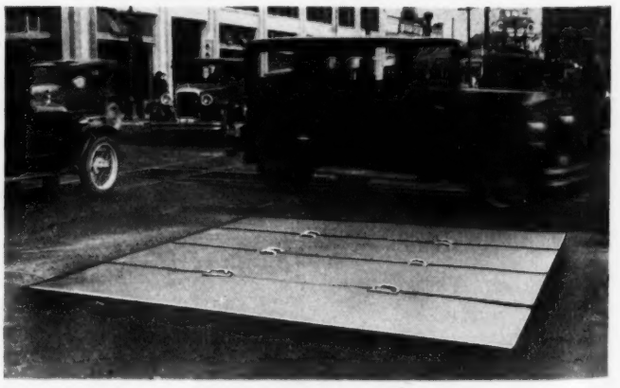
MISCELLANEOUS SUBSTATION EQUIPMENT COSTS

| | | |
|---|---|---|
| Chain link fence 250 ft. long, 7 ft. high installed | | $527.04 |
| One 16-ft. double-drive gate | $94.08 | |
| Cement, two bags at $1.70 | 3.40 | |
| Labor installing gate | 50.00 | |
| | $147.48 | $147.48 |
| Furnished and laid, ¼-in. brown battleship linoleum, 16x20 ft. | | $94.08 |
| Three 1,000-kva., 22,800–2,300–4,000-volt transformers at | $2,888.33 | 8,665.00 |
| One transformer transfer car for above | | 245.52 |
| Three 200-amp., 46-kva., 2,300-volt single-phase regulators at | 1,236.76 | 3,710.28 |
| Seven 5-amp. curve drawing ammeters at | 100.28 | 702.00 |
| Two 3-kw., 2,200–110-volt transformers at | 47.74 | 95.48 |
| One 5-kw., 2,200–110-volt transformer | | 63.86 |
| Copper strips, ¼x1 in., No. 204 copper bar, 400 ft. | | 43.99 |
| Hard-drawn copper bar, ¼x2 in., 297 lb., at 20.54c. | | 61.01 |
| Hard-drawn copper bar, ¼x1 in., 53¼ lb., at 25.73c. | | 13.77 |
| Iron pipe, 1¼ in., 1,195 ft., at 8.003c. | | 95.64 |
| No. 10, 300-amp. stud terminals, twelve at | 1.08 | 12.96 |
| No. 5, 600-amp. stud terminals, nine at | 1.84 | 16.64 |
| G12, 800-amp. stud terminals, three at | 4.18 | 12.54 |
| Five 25-amp., 6,600-volt expulsion fuse cutouts and holders | | 51.00 |
| Two 60-cycle, 200-watt, 2,200-volt potential transformers | | 56.10 |
| Installation of twelve 25 kv. current transformers in outdoor substation: | | |
| Twelve current transformers, 150-300 amp., ratio 30–60 to 1 | | $2,481.00 |
| Labor on above | | 1,226.21 |
| Engineering | | 271.19 |
| Miscellaneous material | | 812.70 |
| Total cost of above job | | $4,791.10 |

## Avoiding Traffic Interference with Underground Construction

IN THE business district of Los Angeles utilities are required to do all construction work in the streets at night and leave the street free of all obstructions by 7 o'clock in the morning. To cover manholes and duct-line trenches during the daytime the Los Angeles Gas & Electric Corporation uses heavy steel plates as shown in the accompanying illustration. These plates are ½ in. thick, 10 ft. 6 in. long and 3 ft. wide, and are supported by railroad rails spaced 2 ft. apart over manholes. The steel plates are practically flush with the pavement, making a smooth running surface for traffic with adequate safety features.

Night underground construction crews go to work at 7 p.m. and quit at 7 a.m. Day cable splicers leave the shop at 7 a.m. to avoid heavy traffic in the morning and quit at 4 p.m. in order to be off the streets before the evening rush hour. Another advantage of these working hours is that congestion in getting out material and crowding in the washrooms is avoided between underground crews and line gangs, since the latter work from 8 a.m. to 5 p.m. These excavation covers are very effective preventers of traffic congestion and still permit night construction and daytime splicing to continue.



STEEL PLATES COVER MANHOLE EXCAVATIONS DURING DAYTIME AND ARE READILY REMOVABLE

# Wiring Materials and Methods*

The Edison Sales Managers Association goes adventuring in wiring methods. An interesting experiment in new materials and a discussion of policy

THE electric utilities must undertake the job of correcting some of the serious evils that have crept into the wiring situation. No one else can undertake the task. The individual house builder and owner is unorganized and helpless. He buys or builds a house but once or twice in a lifetime and must take what the industry provides for him. However much he suffers under their application, he cannot change the rules and regulations that make wiring costly to install, almost prohibitively costly to add to, and that forever limits his use of electrical conveniences and the power company's service and revenue. It is distinctly within the province of the electric utility to speak for its customers, for both of them have to live with the job long after other interests have passed out of the picture. By proper educational methods and by adequate supervision they should see that all new construction is being adequately wired at reasonable cost and that materials and methods are developed to correct unsatisfactory conditions in old residences.

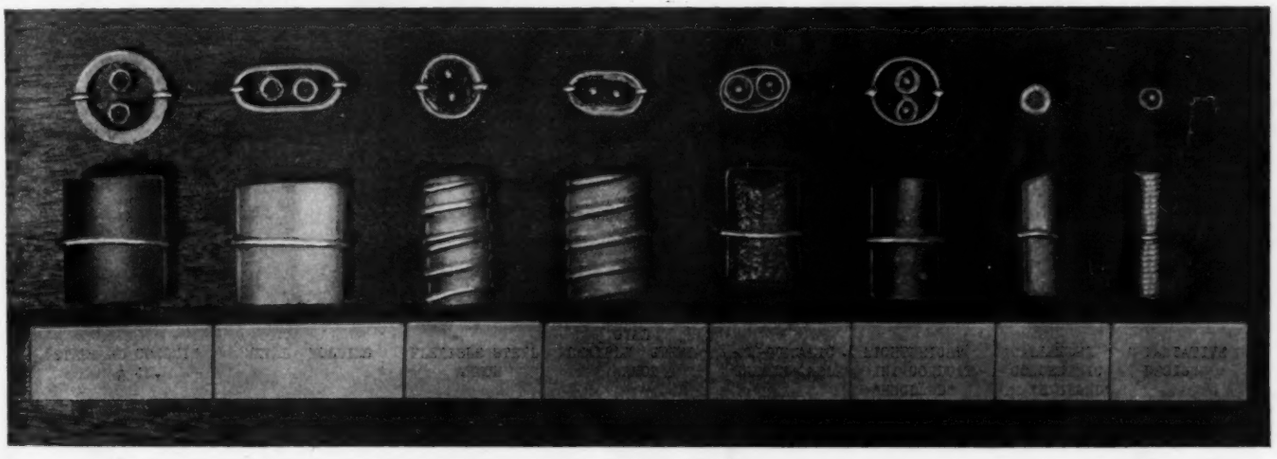


FIG. 1—TYPICAL HOUSE-WIRING MATERIALS WITH A TENTATIVE NEW DESIGN ON THE RIGHT

Many of our own rules and regulations can well be subjected to severe scrutiny. When it takes two or three meters with their added wiring details to supply the ordinary fully equipped residence, there is something the matter with our rules or rate structure, or both.

The manufacturer of wiring materials is prepared to produce whatever his trade demands. At present he is doing just that thing. He sells to the electrical contractor, and in general the latter would like to see house-wiring jobs cost more and not less. No definite expression of a demand for lower cost wiring reaches the manufacturers—many of them will tell you there is no such demand and cite perfectly good statistics from electrical leagues, labor organizations and inspection departments to prove their point. In the meantime the householder does his own added wiring with material from the 5 and 10-cent store—or else he does without. Of course no one benefits by this situation—the contractor does not get the business, labor does not have the job, insurance risks are surely not improved and the central-station revenue is reduced. But if you suggest the perfectly obvious solution of improved methods all h—l breaks loose in short order. You can revise the rules and standards (and costs) upward and be greeted with loud cheers—any move in the contrary direction brings threats of summary execution for interference with divine law. What this country (and our industry) needs more than it needs Tom Marshall's good 5-cent cigar is the abolition of about 90 per cent of the laws, rules, regulations and codes it is burdened with, and the substitution therefor of a little personal liberty, common honesty and common sense. We do not believe that in urging lower cost wiring we are working against the ultimate best interest of either the public or a single branch of the electrical industry. Quite the contrary. Lower units costs in any field mean an increasing number of possible purchasers. Every reduction of our own rates results in increased use. The automobile industry has constantly reduced prices in spite of increasing labor and material costs, until a dollar spent for a car today buys more and a better product than a dollar and a half in pre-war days. The automobile, the kilowatt-hour and the incandescent lamp are some of the very few products whose cost to the public is below pre-war levels.

The present line of wiring materials is a miscellaneous collection of junk that, like Topsy, "just growed," and with even less supervision. The same can be said of the rules governing its installation and use. Both are just good enough to get by in new construction work, but

*Abstract of report of the Edison Sales Managers Association presented to the Association of Edison Illuminating Companies at Colorado Springs.

are absolutely impossible for use in existing buildings. Wiring is made up of the following elements:

(*a*) The electrical conductor.

(*b*) Outlet box.

(*c*) Switch mechanism, receptacle or socket placed in the box at the termination of the conductor.

The electrical conductor is made up of rubber-covered copper wire and is used with a protective material of (1) separate metal conduit, (2) self-contained metal or flexible armor, (3) separate porcelain knobs and tube, (4) self-contained fabric armor.

Rigid conduit undoubtedly has a field in electrical construction, but that field, we submit, does not include ordinary residence work. Rigid pipe is too expensive to install; it is difficult to add to or extend; it is difficult to conceal such extensions; and lastly, it is unnecessarily heavy and clumsy for the use to which it is put. It is not good engineering or common sense to take two wires of a 110-volt circuit, insulate them for 600 volts and then insist on putting them inside heavy iron pipe that would carry 200 lb. steam or air pressure. The risk requiring such construction simply is not there, otherwise it would not be possible to terminate such construction in a piece of lamp cord looped all over the furniture or to terminate the wiring between the ends of the conduit and the switchboard in the tangle of the commonly used "pull box."

Flexible armored cable of the present design is difficult to work easily and rapidly; it is too large in outside diameter and so almost impossible to conceal—the armor is too heavy and not flexible enough. Most of these comments also apply to non-metallic sheath cable.

Knob and tube work is satisfactory in wood frame buildings installed during construction. Claims to the contrary notwithstanding, we believe it to be somewhat lower in first cost than flexible armor cable. It is not suitable for extension work, and cannot be used except in wood frame buildings.

The other elements of wiring are somewhat less important in any new development program, but are nevertheless capable of redesign in such a way that ease and rapidity of installation can be greatly improved.

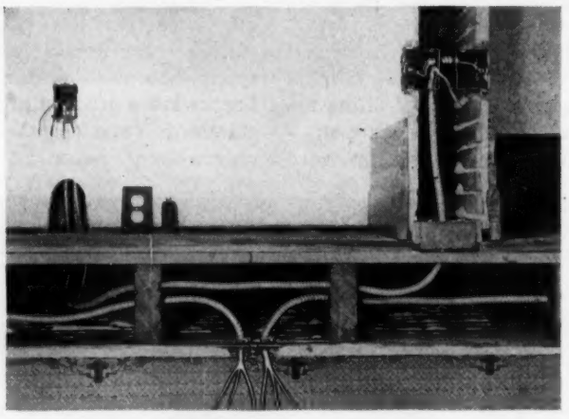
With these ideas in mind, some of the results of our recent surveys do not seem so surprising. These show three things of great importance:

1. There are millions of houses already on our line with inadequate wiring and obsolete equipment. Any estimate of the amount of labor and material necessary to improve this condition runs into almost unbelievable figures. The Luckiesh report said that more than two billion dollars' worth of wiring and fixtures was required at once and that the added central-station residence revenue (at 5 cents per kilowatt-hour) would be $100,000,000 a year. An increase of 50 cents per customer per month would bring this amount.

2. The cost of wiring in some places and under some conditions has reached absolutely unreasonable and dangerous figures. When it costs $5 to $8 or more per outlet to wire the small residence, there cannot help but be a limitation to the minimum number of outlets. The householder compares what he can get for his money with what it will buy in other things and decides than anything more than the simplest electrical layout is too much of a luxury for him. Unreasonable wiring costs can be just as severely criticised as unreasonable rates, and the householder will not be slow to find fault with them.

3. It is almost impossible to add additional outlets to an existing wired house at a price the owner can be persuaded to pay. The sales resistance to such an effort is out of all proportion to the results obtained. The

FIG. 2—TANDEM-DUPLEX OUTLETS IN PARTITION, EXTENDED FROM EXISTING OUTLETS WITH BOX



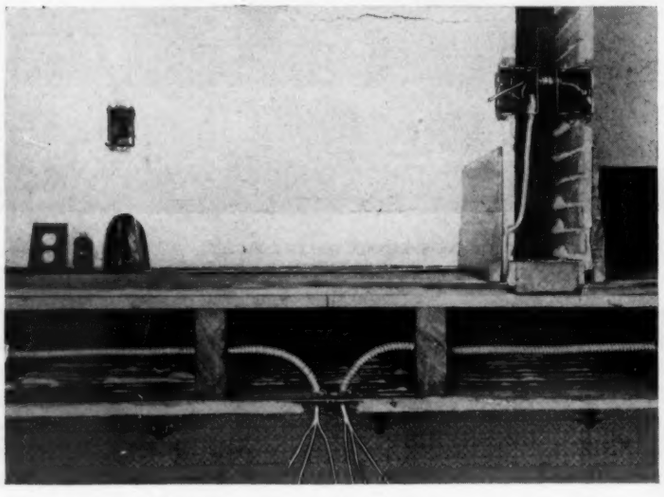


FIG. 3—SUGGESTED WIRING OF TWO ROOMS FROM A SINGLE OUTLET WITH SMALL CONCEALED CONDUCTOR

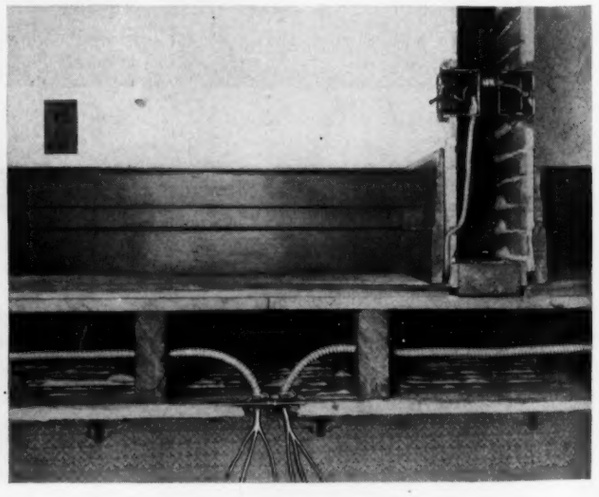


FIG. 4—COMPLETED WIRING OF TWO ROOMS WITH CONDUCTOR CONCEALED BEHIND BASEBOARD

present materials and methods, make reasonable costs impossible. The contractors and the electrical workers do not get the job—instead the 5 and 10-cent store sells a little material with the result before mentioned. This condition in itself shows that our restrictions are unreasonable and that simpler methods are possible and sufficiently safe. Anyone present can protest this statement who has no illegal use of cord in his own house or office.

The committee believes it is justified in making the statement to you that progress in the development of wiring materials and methods is being definitely obstructed. This applies both to the design and introduction of new materials and to the restrictions of various rules, codes and laws, local and national, that tend to prevent the introduction of improvements. No other industry is so surrounded by restrictions. If there were a law requiring all automobiles to be of the $5,000 class, a lot of people would have to do without cars. In things electrical a lot of people have to make a similar sacrifice. We find a definite tendency toward higher unit costs and an organized effort opposed to any practice or material that will make it easier and cheaper to secure the millions of outlets we and our customers so badly need. This situation will continue to be a burden on the industry until the electric utilities take whatever steps are necessary to correct the conditions. A manufacturer cannot introduce changes requiring code modification in the face of opposition from other makes of materials affected unless he is assured of support from the electric utilities or the public. The latter, being unorganized, cannot in the beginning make the weight of their opinions effectively known.

We believe it to be incumbent upon the industry to speak for the unorganized consumers who are our customers. We can have no selfish interest in so doing. Our earnings are limited by state supervision. Increased residential use can only result in rate reductions. Electricity is the household servant of this day and age. Our rates make it equally available to the rich and poor alike—we cannot afford to see its use artificially restricted by other interests to those to whom expense is a secondary consideration.

In some parts of the country organized labor has taken a position opposed to the introduction of low-cost wiring materials and methods that is economically unsound. This attitude is just as wrong as was the opposition to the introduction of automatic machinery a century ago and in the long run cannot help but fail. The industrial prosperity of the United States is based upon the development of improved methods and the provision of every ingenious mechanical device that will increase production. Contrary to the ideas common in the Old World, we recognize the brains and strength of labor as too valuable to be used in doing anything a machine can be made to do. And, in general, labor has shared in the increased wealth such methods have produced. Nowhere else on earth does the man who works have as many of the comforts and pleasures of life. Because he produces more he

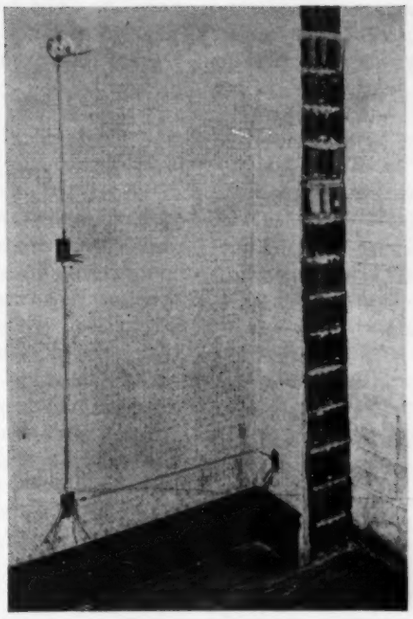


FIG. 7—SMALL CONDUCTOR EXPOSED IN WIRING CHANNEL IN WALLS

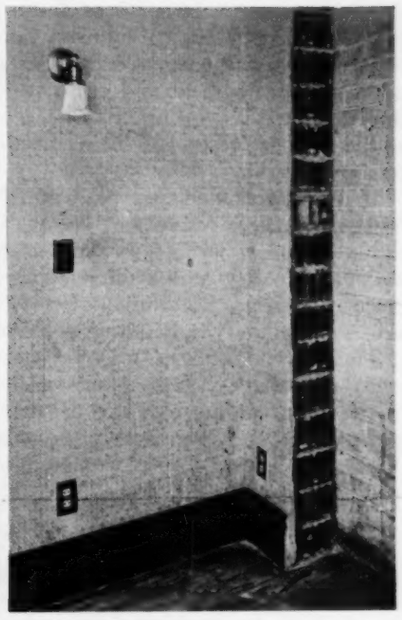


FIG. 8—COMPLETED WIRING, USING SMALL CONDUCTOR IN WALLS

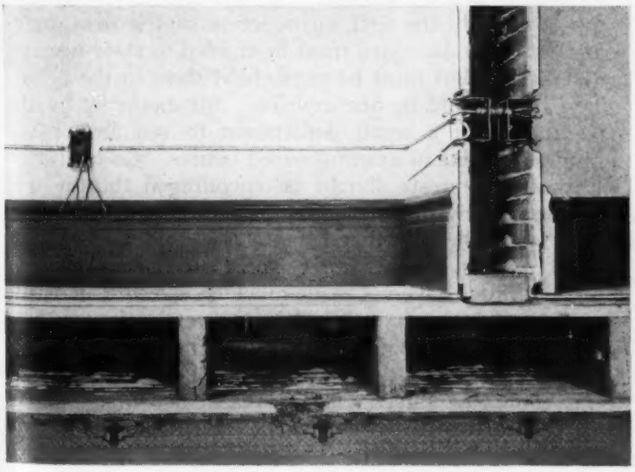


FIG. 5—SMALL CONDUCTOR IN WIRING CHANNELS IN WALL RUNNING TO OUTLETS IN TWO ROOMS

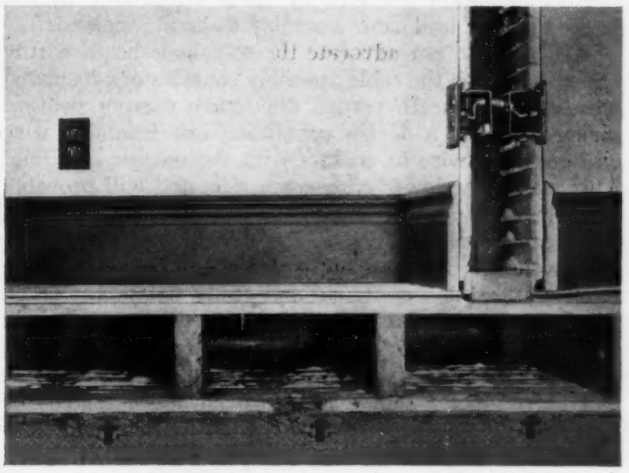


FIG. 6—COMPLETED AND PAPERED WIRING OF TWO ROOMS, USING SMALL CONDUCTOR IN WALL

can enjoy more. In spite of these facts we find some branches of the electrical industry opposed to every effort to reduce the unit costs of wiring, by artificial restrictions upon the development and use of new materials. Is not this idea just as wrong, just as economically unsound, as the one that destroyed the first power looms a hundred or more years ago?

In the meantime labor pays more for its houses and must live in less convenient homes. Its family's use of the universal household servant—electricity—is curtailed and made costly and inconvenient. It is the medium-priced and small home that carries the burden—pennies are not counted in building a mansion.

The electric utilities must oppose such practices by every reasonable means, otherwise they fail in their duty to the whole public they are organized to serve and the professional politician will again be moved to put on his conversational armor and once more rise in defence of the people.

### Designs Restrictive

The committee submits the definite statement that the basic cause of most of the difficulties before us lies in the present design of the conductor or cable assembly and the restrictions on its use. We feel sure that it is practical to design a cable assembly having a very small over-all diameter (not over $\frac{1}{4}$ in.) to contain two No. 14 or No. 12 wires, that can be installed easily and rapidly, and be easily concealed. Additional work in existing houses is not now practical because it is difficult and costly to put in the types of conductors now available. To some extent we have been guided by European practice; the design of some of the material in common use over there—often at double our voltages—can be modified to suit our conditions. Some of the accompanying illustrations show the type of construction encountered in the use of a lead cable assembly made in England.

While we do not advocate the so-called sheath wiring system in which the cable assembly contains one insulated wire and the sheath carries the return current, we are inclined toward a design containing one insulated wire and one bare wire in contact with the outside covering. This makes for lower cost, small size, and will probably assist in working out some of the problems of grounding of portable devices. We think a metallic covering desirable, although not absolutely necessary, but it must be light and flexible—easily cut and easily stripped. Something on the order of spirally wound metal tape would probably be satisfactory for specification and use in this connection.

This conductor should be approved and accepted for general use in the simplest way. It can be channeled into plaster secured to wood trim and painted over as shown in the illustration. Almost by itself it solves the problem of adding outlets in old houses in rapid, economical fashion. The basic idea is amply safe, as is proved by general use in Europe for 230 volts, and is in any event a great improvement over the tangle of lamp cord shown in Fig. 1.

### Summary

If we assume that improved methods and lower cost of wiring are desirable for the benefit of both the public and ourselves and if we assume that the materials can and will be produced, what are the next steps?

First, the design and manufacture of the new materials involves its acceptance into the code rules. This cannot be obtained without the definite active support of the electric utilities themselves. No single manufacturer can obtain approval of a new product in the face of the opposition encountered in the rule-making organizations from other manufacturers of products affected. We do not want a repetition of the sorry exhibition put on over non-metallic sheath cable. For this reason it will probably prove undesirable to tie the solution too closely to a single manufacturing interest. We must ourselves establish fairly definite standards of the material we desire and then assist the manufacturers in securing its general approval.

Second, a very unhappy situation exists in many parts of the country due to local rules that are out of line with the theory and practice of the National Electrical Code. A little investigation will usually bring out whatever is responsible for unreasonable restrictions. This condition must be corrected in the general interests of the public we serve. Interests outside of the electrical industry are vitally affected and their support can be secured wherever necessary. Builders, real estate operators, bankers and boards of commerce will support efforts in this direction.

Third, it will be necessary for the electric utilities to support directly the first introduction of the new materials and methods. Men must be trained in their use and active sales effort must be put behind them in the beginning. This could be accomplished, for example, by the organization of a small department to sell and install additional outlets in existing wired houses. Co-operation with other interests should be encouraged, but it will prove extremely unsatisfactory to leave the introductory efforts altogether in other hands.

We think it can be fairly stated that the organized electric utilities have not made much of a record in active support of research and original investigation. Most of the credit for electrical development must be given to the manufacturers. The problem we place before you today cannot be solved (in any reasonable time) unless the utilities themselves are prepared to place men and money behind the effort. The co-ordination of the various interests involved and the presentation of our customers' viewpoint and vital interests are distinctly the

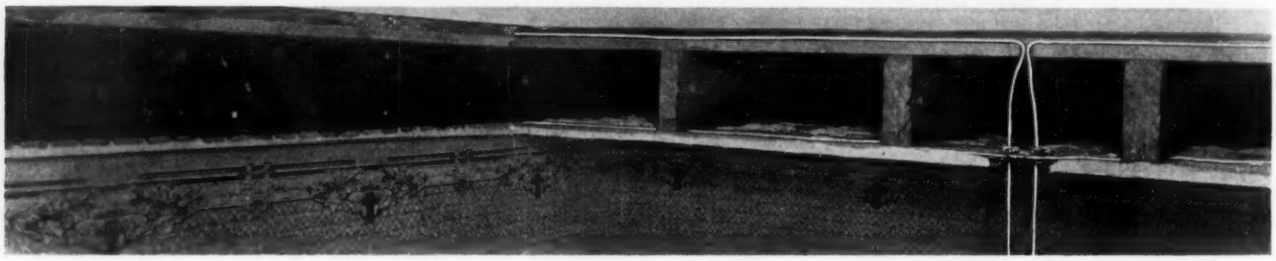


FIG. 9—WIRING USING SMALL DUPLEX CONDUCTOR CONCEALED IN FLOORING GROOVE

task and the opportunity of the central-station industry. A satisfactory solution will contribute much toward the upbuilding of the industry and of public good will for that industry.

For these reasons we venture to hope that this convention will order the formation of a committee of the association charged with the responsibility, first, for further study of the situation but ultimately with the job of securing the co-operative design, production and introduction of improved and lower cost wiring materials and methods, and of the code rules, etc., that will permit their general and economical use. Such a committee must set up a paid organization somewhat along the lines of the rate research committee plan and to this end must be provided with men and money to carry on its work. We believe the program can be got under way in five years of well-directed hard work and that the expense involved will be from one-quarter to one-half million dollars.

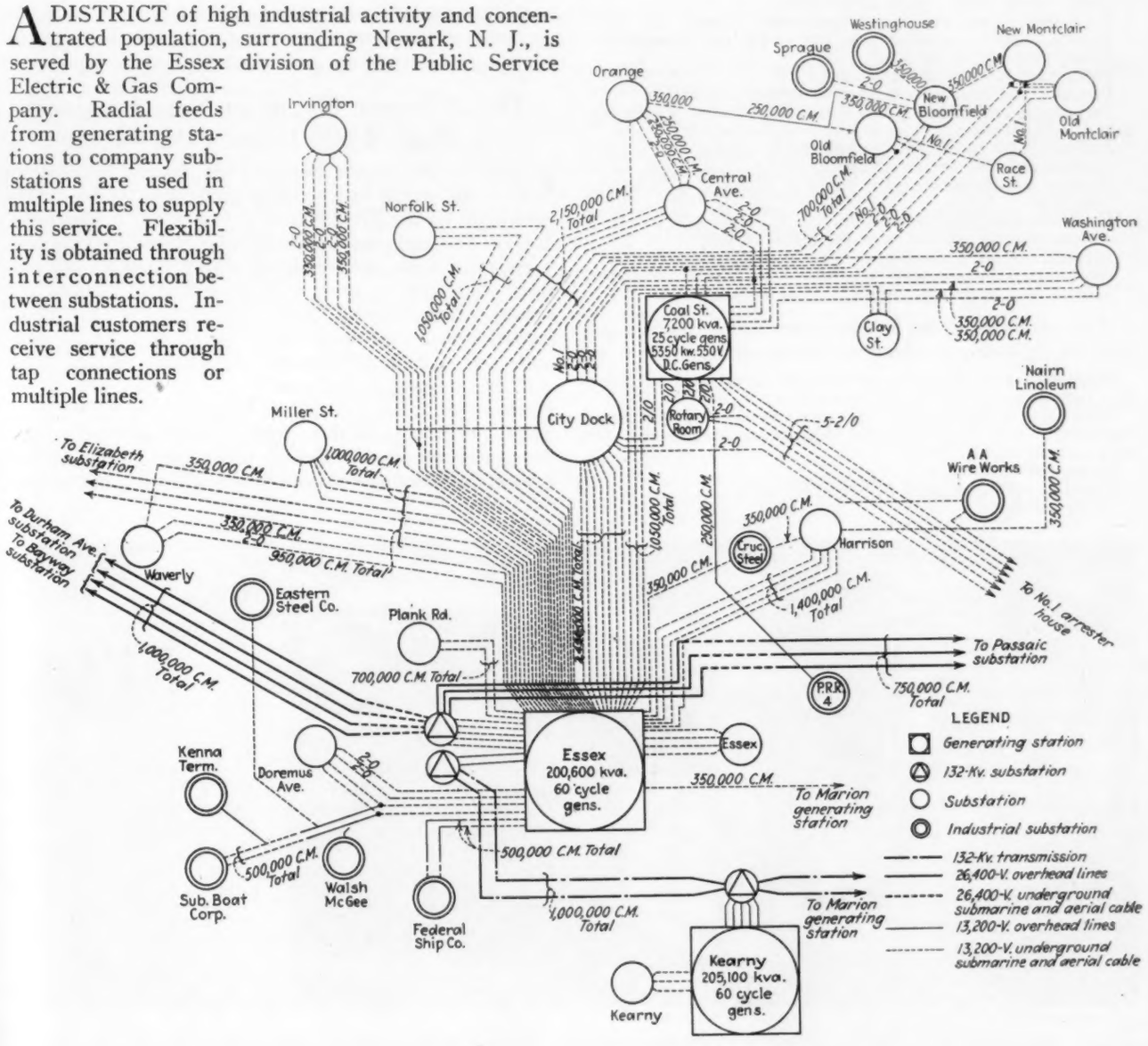
# Steam-Station Instruments and Records

AN IMPORTANT element in the control of station operation involves the selection and proper use of instruments and the keeping and analysis of records made by them. The data recorded should be of such a nature as to be valuable for immediate analysis or future reference. A detailed study of what constitutes a reasonable selection of steam-plant instruments and records has been made by a sub-committee of the Southeastern N.E.L.A. prime movers committee. A résumé of this investigation is given herewith.

In making comparisons between the efficiencies of different plants, careful consideration should be given to the type of equipment in use, as it frequently happens that it has been found economical to install plant refine-

## Concentrated Generating Stations, Interconnected Substations and Multiple Feeds Afford Reliable Industrial Service

A DISTRICT of high industrial activity and concentrated population, surrounding Newark, N. J., is served by the Essex division of the Public Service Electric & Gas Company. Radial feeds from generating stations to company substations are used in multiple lines to supply this service. Flexibility is obtained through interconnection between substations. Industrial customers receive service through tap connections or multiple lines.



ments in one case which would not be feasible in others because the increased operating efficiency is more than offset by the increased capital charges made necessary by the installation of the additional plant refinements. Where the cost of fuel is high, or in plants used for base loads, usually plant refinements in the form of economizers, air heaters and reheating of steam are more than justified. When, however, fuel is cheap, or in the case of stand-by steam plants of hydro-electric systems, such refinements would not be an economical investment.

The problem of obtaining highly trained operators for the more modern plant equipment also influences the degree of refinement that should be obtained. This is especially true of plants in inaccessible parts of the country, as skilled operators and maintenance men are not readily attracted to such plants. In the last analysis, a highly trained operating personnel is essential to the efficient operation of a plant.

Many of the Southeastern light and power companies consider essential daily information as follows:

Average steam pressure for 24 hours.
Average steam temperature for 24 hours.
Average feed-water temperature for 24 hours.
Average circulating-water temperature.
Average absolute pressure in inches of mercury.
Total kilowatt-hour output for 24 hours.
Total station water rate per kilowatt-hour output.
Pounds of coal or equivalent of fuel or gas per kilowatt-hour.
Boiler efficiency for 24 hours.
Percentage of power used in plant.
Percentage of condenser leakage in surface condensers.
Percentage or degree of concentration of boiler water, condensate, circulating water, etc.
Average daily atmosphere temperature.
Average daily barometer reading.
Weather conditions.
Peak load.
Maximum load hour for each day.
Average British thermal units per pound of fuel.
Average number of employees.
Work done on maintenance schedule.
Amount of fuel in tanks, bunkers or in storage daily.

The consensus of the Southeastern companies indicates that the following instruments are essential:

Water-measuring meters—various types to be used on boiler-feed lines or for measuring condensate.
Steam-flow meters—various types with combination type showing amount of air, steam flow and chimney gas temperature when used on boilers.
Boiler draft gages.
Traveling weighing larry and railroad scales.
Vacuum gages.
Mercury column.
Recording pressure steam gages.
Recording pressure gages for feed-water pressures.
Recording temperature gages for steam and water.
Master steam gage in boiler room.
Indicating frequency meter.
Recording voltmeters.

The following meters and instruments are also of great value, in the opinion of several of the companies:

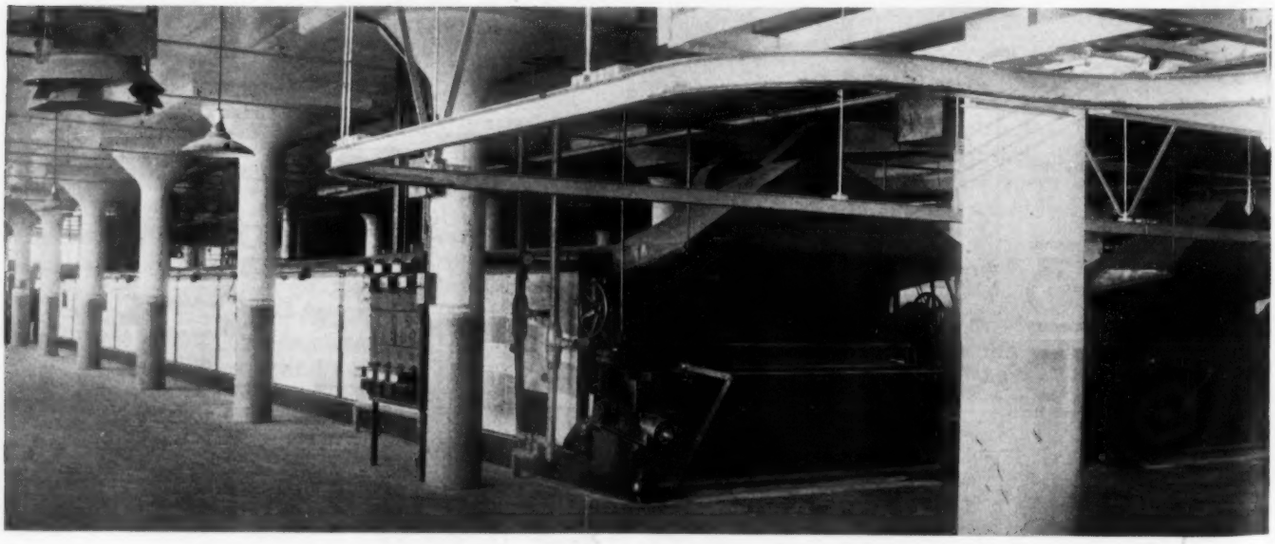
Indicating absolute pressure gage.
Balanced draft equipment.
Fuel-measuring equipment.
$CO_2$ recorders.
Recording thermometers for registering temperature of generator coils, bearings, etc.
Recording frequency meters.
Load indicator for boiler room.
Feed-water regulators.
Water-level recorders for boilers.
Flue gas pyrometers.
Laboratory equipment for testing fuel.

All of these meters are to be considered additional to the usual type of meter supplied by the manufacturer.

The log sheets used by the various companies differ so much that a standard log is not practical. If, however, they provide the data obtainable from the instruments named, they will serve the required purposes. Some companies favor the making of graphs of operating data, including load curves. The more information that can be obtained the more efficiently can a plant be operated.

## Two Electric Ovens in New England to Bake 8,400 Loaves Per Hour

ONE of the largest electric bread-baking installations in the world has recently gone into service at the new plant of the First National Stores, Inc., Somerville, Mass. The equipment includes two Baker-Perkins conveyor-type ovens, each equipped with 530 kw. in 440-volt, three-phase heating units with seven control sections and a motor-driven hearth (7.5 hp.) and exhauster fan (5 hp.) besides a push-feed motor of 0.5-hp. rating. The heating units and control switches are of General Electric make and the indicating and control instruments are of the Brown type. The capacity of each oven is 4,200 22-oz. loaves per hour, and the output is scheduled for 1,000,000 loaves per week. Energy is supplied by the Boston Edison Company for complete electric service throughout the bakery.



CONVEYOR TYPE OVENS AID NEW ENGLAND BREAD BAKERS

## Machine Tool Makers Discuss Need for

# Standard Motor Dimensions

**Lack of uniformity said to be an expense and trouble to manufacturers and users of machine tools. Standardization of general purpose motors said to be no more difficult than that of steel-mill motors**

MANUFACTURERS and users of machine tools and other motor-driven machinery in the United States have been put to great trouble and expense because of the lack of uniformity in the mounting dimensions of the electric motors built by the different manufacturers. Not only does no uniformity in these dimensions exist but there is very little attempt at uniformity. The old Electric Power Club, now merged into the National Electrical Manufacturers Association, drew up a set of standards of shaft extensions which were adopted as recommended practice. These are the only dimensional standards the motor-manufacturing industry has in this country, and but few companies are following them. This is very much in contrast with the situation in Germany, where the motors built by all manufacturers have the same mounting dimensions.

*APPEAL for standardization and simplification of apparatus frequently initiates from the buyers and users as an aid in solving their practical problems of construction and operation. Lack of uniformity in the mounting dimensions of the electric motors built by the various manufacturers has often been pointed out by the manufacturers and users of machine tools as a trouble and an expense. R. C. Deale, electrical engineer of the Niles-Bement-Pond Company of New York City, at a recent production meeting of the Society of Automotive Engineers presented the accompanying paper on this subject.*

*After outlining the way in which non-uniformity of mounting dimensions creates difficulties in installation and maintenance, and presenting standard dimensions, attention is called to the fact that a series of standard dimensions already has been worked out to apply to the special motors generally used in steel mills for operating various auxiliaries, and that the dimensions have been accepted by the manufacturers of these motors. The author believes it is no more difficult to work to standard dimensions for machine tool electric motors than it is in the case of electric motors for steel mill auxiliaries.*

Table I shows the comparative dimensions of the 5-hp. squirrel-cage induction motors of 40 deg. C. continuous rating at 1,200 r.p.m. as built by thirteen representative American manufacturers, and Table II gives the same information for direct-current motors. As can be seen, only three manufacturers of direct-current motors and three manufacturers of alternating-current motors follow the recommended standard, which has been in effect eight years. I believe that this shows what progress toward standardization the motor manufacturers are likely to make of their own volition. A strong customer demand is needed to hasten a complete standardization of mounting dimensions.

Two large classes of motor mountings exist, and these require two degrees of standardization. The first, and oldest, class is still much the larger. This comprises those machines in which some flexible type of drive, such as chain, belt or texrope, is used between the motor and the machine. In this class of drive the dimensions of the motor-shaft extension, *u, n, t* and *s,* are of most importance, although dimensions *h, a, b, e* and *f* are also important. Where shaft extensions are not the same, each motor drive must be sent through the shop separately, so that the pulley or sprocket can be machined to fit the motor being used. This naturally delays shipment, as it prevents the use of a standard piece of equipment. It also increases the cost of the machine, because the machining of the piece in question requires special attention and always requires an individual machine set-up when the bore is being machined.

Holding-down bolts must also be treated separately, as no one size will do for all motors of the same rating. In the case of the motors shown in Tables I and II four different sizes of clearance bolts or seven sizes of body-fit bolts are needed, depending on which construction it is desired to use. This seems to be entirely unnecessary, especially as most holding-down bolts seem to be considerably larger than is necessary to resist the torque when the motor is inverted. It seems very easy to come to some agreement on this point. The great spread in the mounting dimensions *a, b, e,* and *f* makes it impossible to design a mounting platform that will suit all motors and yet look well. The variance of the dimensions *e* and *f* make it necessary to locate the holes for the holding-down bolts from the motor and then either to remove the motor platform from the machine for drilling these holes or to drill them in place by some form of portable drill. Either operation is slow and expensive as compared with drilling from a jig, which could be done if the location of these holes were standardized. The foregoing operations easily can add a week to the delivery of a machine, and $25 to $50 to its total cost, although much of this cost may not show directly because of being buried in the overhead.

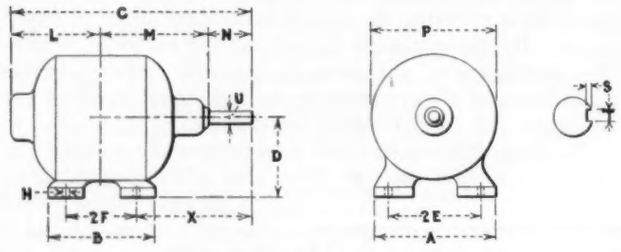
### Gear Drives Present Most Serious Problem

In the case of gear drives the situation is much more serious. This type of drive is being used much more frequently at present than formerly, and is consequently becoming the most important of the various forms of motor drive. Here the shaft extension and holding-down dimensions are just as important as in the previous case.

TABLE I—COMPARISON OF ALTERNATING-CURRENT MOTOR DIMENSIONS*

| Make | Type | Frame | Shaft Extension, In. | | | | h | d | b | 2f | a | 2e | x | l | m | c | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | a | n | t | s | | | | | | | | | | | |
| Allis-Chalmers† | AR | 110-D | 1⅜ | 5 | ⅜ | 3/16 | 4 1/16 | 6½ | 11⅛ | 8½ | 12¼ | 10 | | | | | 12⅜ |
| Louis Allis | HD | L 618 | 1¼ | 3¾ | ¼ | ⅛ | 2 1/32 | 7¾ | 9⅛ | 8¾ | 14¾ | 11¾ | 8 7/16 | 9 5/16 | 9 9/16 | 22⅜ | 14½ |
| Century | SC | 8 B | 1½ | 4½ | ⅜ | 5/16 | 1 7/32 | 7 | 12⅞ | 10½ | 13 | 10¾ | 8 13/16 | 9 21/32 | 9⅞ | 24 1/32 | 13⅝ |
| Crocker-Wheeler | Q | 13 | 1½ | 3¾ | ⅜ | ⅛ | 2 5/32 | 7⅝ | 11¼ | 9¼ | 14½ | 12 | 8¾ | 9⅝ | 9⅝ | 23 | 14¾ |
| Electro-Dynamic‡ | AK | 131 | 1⅜ | 3½ | ⅜ | 5/16 | 1 1/16 | 8⅜ | 8 | 6¼ | 16 | 13½ | | | | | 16 |
| Fairbanks-Morse | B | 8 C | 1 7/16 | 4½ | ⅝ | 5/16 | 1 7/32 | 7 1/16 | 9⅜ | 7½ | 15¾ | 12½ | 10 5/16 | 9 7/16 | 9 11/16 | 23⅝ | 14⅞ |
| General Electric | KT | 946 | 1¼ | 4 | ¼ | ⅛ | 2 1/32 | 7 | 11¼ | 9¼ | 14 | 11¼ | 8½ | 9 3/16 | 9⅛ | 22 5/16 | 14 |
| Lincoln | D | 212 | 1⅝ | 4⅝ | ⅜ | 5/16 | 9/16 | 6¾ | 12⅜ | 10⅜ | 12⅝ | 10¼ | 9 | 9¼ | 9 9/16 | 23 1/16 | 13 |
| Reliance | AA | 22 | 1¼ | 3¾ | ¼ | ⅛ | 1 9/32 | 6¾ | 10 | 8 | 13 | 10½ | 8 7/16 | 8⅜ | 8 11/16 | 20 13/16 | 13¼ |
| Robbins & Myers | L | 630 | 1¼ | 3¾ | ¼ | ⅛ | 9/16 | 7 | 7½ | 6 | 12½ | 10 | 10⅜ | 9 7/16 | 9⅝ | 22 13/16 | 13¼ |
| Star‡ | A | 45 | 1 7/16 | 5 | 5/16 | 9/32 | 1 7/32 | 7¼ | 9⅞ | 7½ | 14⅝ | 12¼ | | | | | 13⅞ |
| Wagner | RP | 11T | 1⅜ | 4 11/32 | ⅜ | 5/16 | 2 1/32 | 7⅜ | 12 | 9¼ | 15½ | 15 | 8 15/32 | 8¾ | 8¾ | 21 27/32 | 13⅞ |
| Westinghouse | CS | 254-C | 1¼ | 3 7/16 | 5/16 | ⅛ | 2 1/32 | 6¾ | 14¾ | 12¼ | 13½ | 10½ | 6 11/16 | 9⅝ | 9⅝ | 22 11/16 | 11 9/16 |
| N.E.M.A. Standard | | | 1¼ | 3¾ | ¼ | ⅛ | | | | | | | | | | | |

*These are 5-hp. squirrel-cage induction motors of 40 deg. C. continuous rating at 1,200 r.p.m., two or three phase, with sleeve bearings.
†Roller bearing. ‡Ball bearing.



ALTERNATING-CURRENT MOTOR

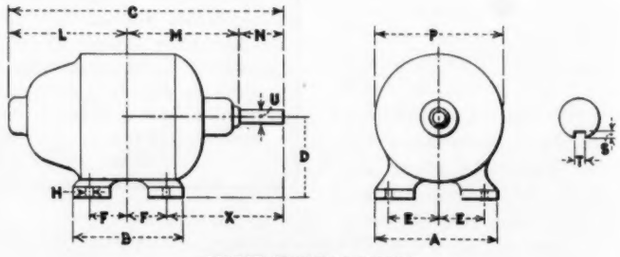
In addition, the dimensions *d* and *x* must be considered, to assure that the axis of the motor bears the proper relation to the axis of the motor pinion or driven gear. In a drive of this type it is necessary to make an attachment drawing every time a different motor is used. The pattern for the base plate usually must be altered or made specially, and this base plate always must be put through the foundry and machine shop separately for each machine.

Because of the lack of uniformity in the dimension *d*, differing even from the dimension adopted by the motor manufacturer himself, it is necessary to measure this height on the individual motor to be mounted and to machine the base plate to suit that motor. Variations of $\frac{1}{32}$ in. or more in the height are not uncommon. Frequently it is found that the plane of the base is not parallel with the axis of the armature, sometimes to so great an extent that it is necessary to take a cut off of the bottom of the motor feet to true them up. All this naturally takes time and adds to the cost; consequently the delivery time is extended and the cost to the purchaser, which naturally must cover the manufacturer's costs if he expects to remain in business, is higher than it otherwise would be. The variation in the dimension *x*, which some do not seem to consider seriously, is sometimes enough to require a new base-plate pattern, when the center height is so close to an older pattern that otherwise it could be modified slightly.

## Motor Designers Differ Widely

Motor manufacturers claim that standardization of dimensions would interfere with their freedom of design, but it is difficult to see any great advantage in slight alterations of shaft diameters or of holding-down bolts. Motor designers seem to have differed as widely on these points as on others that are of more importance from the viewpoint of motor design. According to the present status of motor design, it is necessary to use just about the same amount of iron and copper to build different motors of a given rating, regardless of the designer. This is well shown in Table II, in which the spread from minimum to maximum weight is 20 per cent, whereas the mean variation from the average weight is only 4 per cent. It is believed that the variations at any particular stage in the art can be taken care of by variations in the lengths *c* and *l*, which are not so important from the viewpoint of mounting.

Variations in dimensions between alternating-current



DIRECT-CURRENT MOTOR

TABLE II—COMPARISON OF DIRECT-CURRENT MOTOR DIMENSIONS*

| Make | Type | Frame | Shaft Extension, In. | | | | h | d | b | a | f | e | x | l | m | c | p | Net Weight, Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | u | s | t | v | | | | | | | | | | | | |
| Allis-Chalmers | E | 70 | 1⅜ | 3/16 | ⅜ | 5 | 4 1/16 | 8¼ | 13 3/4 | 15 | 5½ | 6⅛ | 10⅜ | 15½ | 10⅞ | 31⅜ | 15 | 375 |
| Louis Allis | NA | I 630 | 1¼ | ⅛ | ¼ | 3/4 | 2 1/32 | 7¾ | 11 | 14 | 4⅝ | 5⅞ | 9 7/16 | 12 13/16 | 10 9/16 | 26⅞ | 14¾ | 330 |
| Century | | | | | No Di | rect-C | urrent | Motor | | | | | | | | | | |
| Crocker-Wheeler | F | I | 1¼ | ⅛ | ¼ | 3⅛ | 2 5/32 | 8¼ | 13½ | 13¼ | 5⅜ | 6 9/16 | 8 11/16 | 11 13/16 | 10 7/16 | 26⅛ | 15¼ | 330 |
| Electro-Dynamic† | SC | 1 | 1⅜ | 5/16 | ⅜ | 4 11/16 | 1 1/16 | 8 7/16 | 11⅜ | 13½ | 4 13/16 | 5⅜ | 8 9/16 | 11⅛ | 13⅜ | 24½ | 16¼ | 365 |
| Fairbanks-Morse† | DH | 70 | 1¼ | ⅛ | ¼ | 3¾ | 2 1/32 | 9⅛ | 11½ | 18 | 4½ | 7½ | 8¼ | 12 1/16 | 9 | 26 9/16 | 17¾ | 355 |
| General Electric | CD | 65 | 1¼ | ⅛ | ¼ | 3¾ | 2 1/32 | 8 | 11¾ | 15⅛ | 4⅝ | 6 9/16 | 8 | 13⅜ | 8⅞ | 26 | 15⅞ | 350 |
| Lincoln | | | | | No Di | rect-C | urrent | Motor | | | | | | | | | | |
| Reliance | T | 23 | 1½ | ⅛ | ⅜ | 4 15/16 | 2 5/32 | 8¼ | 14 | 15 | 5⅜ | 6 9/16 | 9⅜ | 14⅛ | 10 5/16 | 29⅜ | 15¾ | 350 |
| Robbins & Myers | | | | | | | | | | | | | | | | | | |
| Star† | SB | 5 | 1 7/16 | 5/32 | 5/16 | 5 | 2 1/32 | 7 13/16 | 10⅞ | 15¾ | 4 7/16 | 6⅞ | 9⅛ | 11⅜ | 8½ | 24⅝ | 15¼ | 396 |
| Wagner | | | | | No Di | rect-C | urrent | Motor | | | | | | | | | | |
| Westinghouse | SK | 33 | 1½ | ⅛ | ⅜ | 4½ | 2 5/32 | 8¼ | 13½ | 16½ | 5⅜ | 6 9/16 | 9⅜ | 14 15/16 | 10¾ | 30 5/16 | 15⅞ | 346 |
| N.E.M.A. Standard | | | 1¼ | ⅛ | ¼ | 3¾ | | | | | | | | | | | | |

*These are 5-hp. constant-speed sleeve-bearing direct-current motors of 40 deg. C. continuous rating at 1,150 r.p.m.
†Ball bearing.

and direct-current motors of equivalent rating are not so serious as those in the dimensions of one type of motor as made by different manufacturers, but it would be very desirable if all motors of a given rating, for both alternating current and direct current, were interchangeable as to mounting dimensions. At least one company in the United States and one in England have developed lines of motors in which the alternating-current and the direct-current motor mounting dimensions are the same, so that this is not at all impossible. My understanding is that this interchangeability has been secured in such a way that it has been unnecessary to increase the selling price of the alternating-current motors over the prices of similar motors as sold by competitors.

The difficulties encountered by the machine manufacturer due to lack of interchangeability of motors, as already stated, are passed on to the customer in the form of lengthened shipping dates and increased costs, the causes of neither of which he appreciates. But the most serious trouble occurs after a machine has been placed in the production line. All machinery gives trouble at times and requires attention and repair, and the electric motor is no exception.

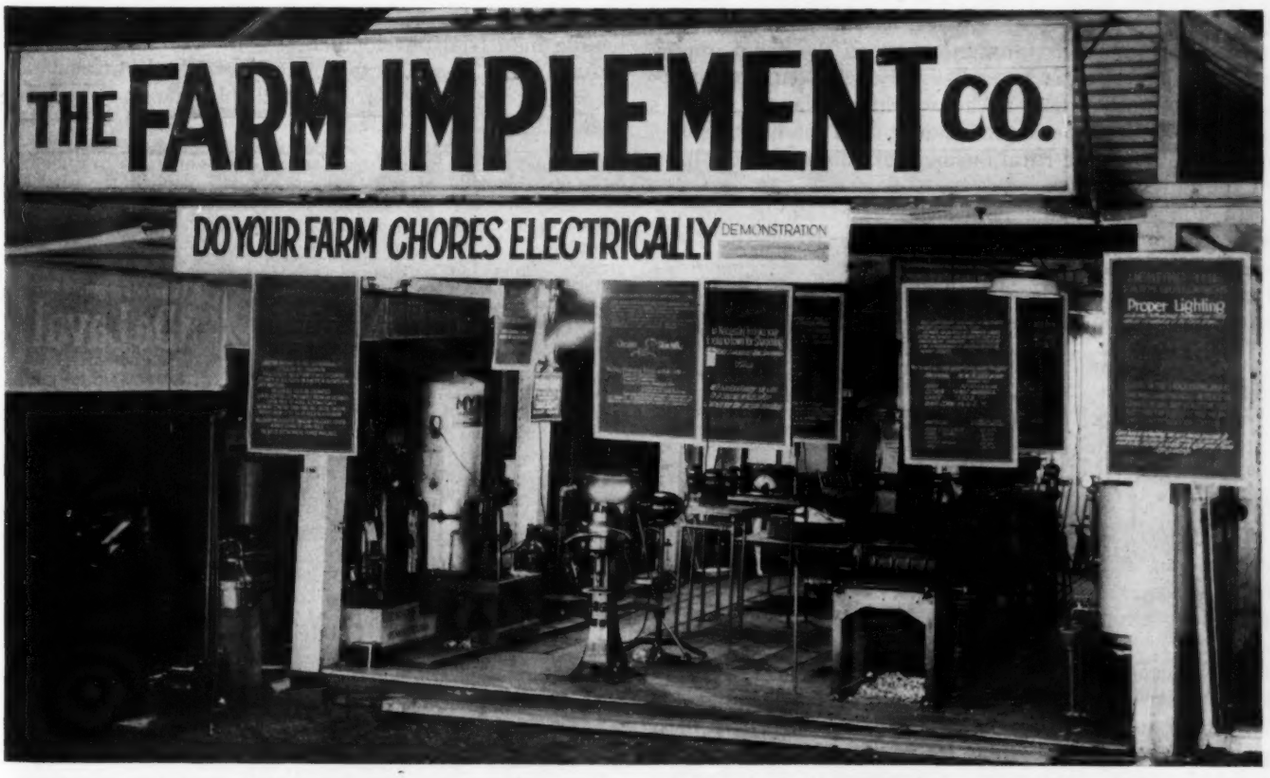
In any plant where there is a constant flow of production it is not possible to allow a machine to stand idle while repairs are being made to the driving motor. Consequently it is the practice to remove the motor that has given trouble and to replace it by a spare, so that repairs can be made at leisure. When troubles are handled in this way, there is the minimum of interference with production, while at the same time electrical repairs can be handled in a much more thorough and systematic way. The cost of repairs usually is less in this way, and the repair department can run much more evenly when it is not necessary to hurry jobs through to prevent machines from standing idle. With the great variations in mounting dimensions, it is difficult to do this. It is impossible to replace a motor with one made by a different manufacturer without considerable contriving. In addition, the frequent changes in dimensions by individual manufacturers make it difficult to replace a motor with one built only a short time later. Changes have been made by some manufacturers on the average of every two or three years for the last ten years, and there seems to be no good reason for this.

The electrical engineers of the iron and steel industries have worked out a series of dimensions for the special motors generally used in steel mills for operating the various auxiliaries. These dimensions, which are the same for both alternating-current and direct-current motors, have been accepted by the motor manufacturers and are now being followed by one of the largest companies. It seems to be no more difficult to work to standard dimensions in the case of standard motors than in the case of these steel-mill motors. The only difference is the larger number of manufacturers who produce standard motors.

## Utility Co-operates with Farm Implement Dealer

THE co-operation of the Ohio Public Service Company's rural department with a farm implement company helped make possible the interesting rural service display shown. This display composed the major part of the Farm Implement Company's showing during the three days of the recent Lorain County Fair at Elyria, Ohio, and received the first award.

It has been estimated that upward of 10,000 persons came to see the line-up of electrically operated farm equipment. Although it is not expected that sales will be made upon occasions such as these, the electrical equipment contracted for during this fair included four




OHIO UTILITY AND IMPLEMENT DEALER SHARE EFFORT IN MAKING FARM EQUIPMENT DISPLAY AT COUNTY FAIR

# *Yesterday and Today*

*From an Address by*

WALTER S. WYMAN
*President New England Public Service Company and Central Maine Power Company*

THE conception of the light and power business in its first few years was merely that of making it possible for a few stores and the homes of a few wealthy people to be lighted by this new attractive kind of lamp (the Edison incandescent).

Up to 1900 nobody talked about selling so many million kilowatt-hours per year, while now a company is regarded as rather small that does not sell about half a billion and scarcely counts in the scheme of things unless its annual output is up around 100 millions.

At the close of the war there was much fear that there would be no use for the large capacities and facilities that the light and power industry had been developing, yet in the last decade these facilities have had to be very nearly doubled to meet the constantly increasing demands of the public. I believe that far more rapid expansion lies ahead.

The electric light and power man, being a pioneer in a new industry and having no history to guide him, has been obliged to keep a sharp watch lest he be deceived by his own optimism and lest the public which has been following him meet with loss on that account. He has not been perfect in this respect. Infallible judgment is impossible, but I believe that, founded upon engineering ideals as it is, and involving almost every business problem as it does, the industry has produced a high type of business man. The science of engineering can tolerate no lies or deceit. . . . the industry's business structures must equally be founded upon fact and fair dealing, and I think that is one of the reasons why the central station in America has prospered so exceedingly.

water systems, a cream separator, a milking machine, two emery grinders and three chicken brooders. Live prospects to the number of 320 were uncovered, of whom 180 are already being served from rural lines.

Of the approximately 140 applications of electricity on the farm, which have been enumerated at one time or another by rural research committees, about twoscore uses were demonstrated in this display.

In line with its effort to co-operate actively with the farm implement dealers in the territory served by its transmission lines the sales department of the Ohio Public Service Company acts only in an advisory capacity—upon occasion supplying salesmen, advertising matter and technical information—in assisting sales of electrified farm equipment. The sales, as such, and all profit accruing from such transactions go to the farm implement dealer except where distinctly self-contained electrical equipment such as household appliances is concerned. Only in the latter instance does the utility share in the profits of the rural business or handle the accounts of the purchasers.

In adhering to this policy the Ohio Public Service organization looks to secure its fair return on the farm electrical business largely from the increased consumption of energy which results with the addition of electrical devices on its existing rural lines.

## Industrial Promotion by New England Utilities

ELEVEN New England central-station organizations out of 53 reporting in answer to a recent inquiry are engaged in industrial development activities. These include: Close co-operation with chambers of commerce and railroads; advertising in newspapers, trade papers and magazines; listing available industry sites; issuing booklets; financial assistance and purchasing of stock in certain industries; purchase and remodeling of buildings for industrial use; solicitation of concerns interested in a particular territory; exhibits at fairs; taking space in a railroad special display car; assignment of an industrial engineer or a sales department executive to conduct activities; co-operation with industrial real estate brokers; close contact with the New England Council and assisting committees to develop industrial survey programs.

In almost no instance did a company report a new industry obtained exclusively as a result of its own activities, as in practically every case the utilities have acted in co-operation with local chambers of commerce or other business interests. Forty-three companies hold Chamber of Commerce memberships, and in many cases utility executives are leaders in these or related organizations. All utilities replying believe that this work is beneficial; six companies intend to establish development activities, and at least two have established separate divisions to handle industrial development.

As a more specific example of how the industrial development activity is proving valuable, the work of two New England companies is cited:

*Company A* has recently organized an industrial development division as part of the sales department and employs the services of a business man. The chambers of commerce were informed of the proposed activities and close co-operation immediately resulted, information, photographs and several prospects having already been obtained for their use.

To assist in such work various financial and business magazines and directories have been obtained and relevant material has been secured from the United States Chamber of Commerce and the United States Department of Commerce. A clipping service has been subscribed to as a possible means of obtaining prospects.

Whenever correspondence is carried on with the West, United States air mail is utilized as symbolic of local initiative.

Every effort is being made to develop thorough contact with all persons whose suggestions are representative of analytical judgment. The financial editors of papers, business economists, business men, bankers and the managers of co-operating business groups are having the work thoroughly explained, all of which results in the receipt of helpful advice and a wide appreciation of what is being done.

The communities are being interested in industrial development surveys, a work that will be assisted in by the most expedient means.

Other agencies similarly interested in industrial development work—the railroads, industrial real estate brokers and the New England Council—are tying in more closely each day for the purpose of centralizing effort.

*Company B* has an industrial development department in charge of an industrial engineer and has already obtained very satisfactory results.

The company has done considerable newspaper advertising,

featuring available properties within its territory, and has also issued booklets relating the advantages offered in its several communities. An industrial survey of the territory is being made.

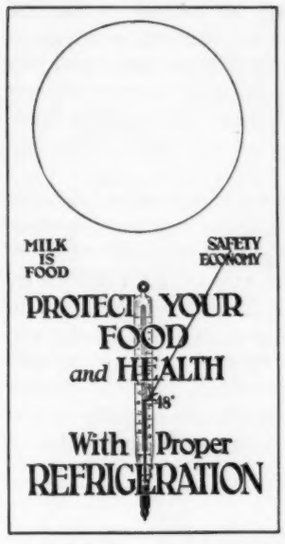
Six new firms have been attracted and one firm that had encountered difficulty was assisted in its rehabilitation. Certain idle properties have been purchased by the company, remodeled and placed in operation. In one instance the company financed the erection of a factory on land contributed by a town as a means of assisting development.

Power rates are being revised in an effort to encourage the use of off-peak and secondary power at low rates, and an industrial engineer devotes his entire time to promoting power sales.

These activities have been reported upon to the power committee of the New England Council by its co-operating committee representing the power industry under the chairmanship of Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston; the other members being Martin J. Insull, president Middle West Utilities Company, Chicago; Samuel Ferguson, president Hartford Electric Light Company; Henry I. Harriman, president New England Power Company, and W. Rodman Peabody, vice-president Turners Falls Power & Electric Company, Boston.

## Co-operative Refrigeration Promotion

CONVINCED that the proper way to foster the sale of refrigeration is for all agencies to advertise and work co-operatively to sell the advantages and necessity of refrigeration to the public, ice companies, power companies, department and furniture stores, ice-box manufacturers, mechanical refrigeration agents, dairies and the gas company of Portland, Ore., joined in a refrigeration educational campaign in the spring of this year.




SAMPLE OF CARD SLIPPED OVER EVERY BOTTLE OF MILK DELIVERED BY NINE DAIRIES

These agencies, linked through the Portland Refrigeration Trades Association, put on a week's intensive advertising campaign during May in which it was endeavored to put across the slogan "Protect Your Food and Health with Refrigeration."

About 250 banners carrying the message were placed on the service and delivery trucks of the participating firms. These included 75 ice delivery trucks, 30 furniture and department store delivery trucks and 24 service trucks of the power companies. Large poster cards numbering 400 were displayed in the windows of the participating firms. Further impetus was given to the idea by the donation of space valued at $800 for 450 street car cards by the Portland Electric Power Company. Also 26,000 stickers were attached to customers' bills by the Northwestern Electric Company. Dairies were quick to appreciate the educational value of the campaign and nine dairies retailing milk attached the accompanying card to the necks of milk bottles during the week.

Agencies participating in the campaign included nine furniture stores, two department stores, five mechanical refrigeration agents, nine dairies, two power companies, eleven ice manufacturers, the gas company and seven ice-box manufacturers. Truck banners were provided by the firms using them and the cost of the general advertising was paid out of a fund raised by assessing the

FLEET OF ICE-DELIVERY TRUCKS OF THE PORTLAND ICE & COLD STORAGE COMPANY CARRYING BANNERS DURING REFRIGERATION CAMPAIGN

This ice distributor, as well as another that participated in the campaign, sells mechanical refrigeration as well as ice, feeling that its position in the community should be refrigeration expert, ready to supply any type of refrigeration desired.

participants from $5 to $25 each according to the size of the business. Besides the paid advertising, newspapers gave freely of editorial, news and feature space and city and state health authorities and domestic science experts and instructors of the two state universities made a number of talks before civic clubs and women's clubs and associations.

Members of the Portland Refrigeration Trades Association realize, of course, that the results of a campaign of this kind must be largely intangible. Nevertheless a marked increase in the sale of ice cabinets by retail stores and the sale of mechanical refrigeration to apartment houses was noted, and it is felt that the cooperative spirit prevailing in Portland is the proper method of attack and will be productive of far greater results than the bitter and unethical sales methods and advertising used in some other sections of the country.

# Letters from Our Readers

## *More About Cost Allocation*

*To the Editor of the* ELECTRICAL WORLD:

C. S. Reed's article in the ELECTRICAL WORLD of Aug. 27 goes a long way toward clearing the atmosphere, if we are open-minded enough to recognize the fact that determining exact capacity costs is not so extremely unlike his "veal and hide" analogy. The fact is that there is no such thing as "accurate" cost allocation in the sense of charging individual customers or classes with the exact costs which they add to the system. Such an allocation would have to be based upon increment costs and would be of no earthly use as a test of rates. The only thing we are interested in is "equitable" cost allocation.

The wonderful development which has occurred in the electric lighting business has resulted from recognizing the effects of diversity of use of the same plant and dividing the cost of carrying the plant between the customers using it, regardless of which of them happened to be responsible for its installation. If this is the case, of what avail is it to allocate costs against a class in excess of what it is intended the rate should collect? We shall only encourage misconception of the actual facts. Peak conditions are more or less temporary; that is to say, business grows so rapidly that yesterday's peak becomes tomorrow's base load. Rates take this fact into consideration and average the collection of costs regardless of temporary conditions. Cost allocations should be made on similarly broad lines.

I believe that Mr. Reed is absolutely correct in pointing out the dangers of misleading cost allocations. In examining any cost allocation the tendency naturally exists to conclude that a rate is unprofitable if the revenue is less than the allocated costs, as the revenue from some rates is bound to be under some of the theories which have been proposed. The commissions are very likely, therefore, to attempt to force increases if such allocations are presented to them. The facts may be exactly the reverse; that is, the revenue may be considerably in excess of the actual cost of a particular rate, and a decrease in the rate may develop a great deal of profitable business, considerably increasing the net income of the company.

We all recognize, of course, that costs must be collected on some logical and systematic basis and that customers must be treated alike under the same conditions. The division of customers into classes is for the purpose of grouping customers having similar characteristics and adjusting the rates to meet the value of service to the different groups. The justification of the different rates lies in showing the effect of the different characteristics upon the cost of supply. Much information can be obtained as to the probable effect of the different conditions upon costs, and it should not be difficult to produce facts sufficient to convince our commissions that the cost allocations which we have based upon these facts are reasonable, if we do not claim superhuman ability in evaluating the probabilities.

If we abandon the claim of "exact" cost allocation, therefore, and present our allocations as "equitable" cost allocations, I believe that we shall be more likely to meet with respectful consideration than if we insist that many of the important factors, the effect of which is incapable of demonstration, are accurately treated under the plans which we advocate. Rates are not intentionally made below increment costs; they are often made below allocated costs. While I do not advocate allocations made upon the increment cost basis, I do advocate basing the allocations upon the theories which have been followed in the rate making; that is, showing how costs are intended to be collected. Comparisons with the revenues from the different rates will then show whether or not the results intended have been accomplished. It is then merely a question of justifying the theories upon which the rates are made, which are now pretty well known and widely accepted.

An advantage of this suggestion is that it opens the door to more than one method of cost allocation, as it is conceivable, for example, that Mr. Greene's method may best suit his conditions, while Mr. Hills' plan may be better suited to his conditions than is Mr. Greene's. Incidentally, I may be permitted to stick to the "summation of demands" method, which I have used for so many years, and which, I still believe, meets the conditions of dividing capacity costs between rates better than any of the other suggested methods, proper allowances being made for restricted hour and 100-per-cent-load-factor business.

A. S. KNIGHT,
Consultant.
Boston, Mass

## *Appreciated Influence of "Electrical World" Editorial*

*To the Editor of the* ELECTRICAL WORLD:

Your editorial of Sept. 17 on "Fragmentary Nature of Data on Private Power Plants," urging the electric light and power industry to aid us in our preparations for the forthcoming census, was very helpful indeed and brought prompt results. The response to the bureau's requests for lists of operators of electric light and power plants, including isolated plants, had been coming in at the rate of perhaps 25 or 30 daily, but after your editorial appeared the receipts rose to 50 or 75 daily. This morning (Oct. 17) approximately 150 lists of operators were received.

We appreciate very much the aid rendered by the McGraw-Hill Publishing Company in the establishment of the Census Bureau's lists of electric light and power plants.

LEVERNE BEALES,
Chief Statistician.
Department of Commerce,
Bureau of the Census, Washington.

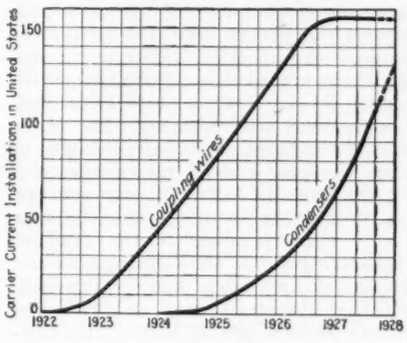
# Digest of Electrical Literature

## *Transmission, Substations and Distribution*

*Mains for Residential Districts.*—HENRY M. SAYERS.—The forecasting of demand and consumption receives the major attention of the author. It is stated that if the demand and consumption of a portion of a distribution area can be forecast with reasonable accuracy, the most economical layout is little more than applied arithmetic. While it is possible to forecast the probable demand and consumption for a house equipped to the full electric standard, difficulty is involved in the determination of the rate at which the houses in any area will advance to that or any intermediate stage of electrical development. The advisability of installing the underground service necessary to take care of an approximation of the ultimate capacity for that district must be balanced against the desirability of installing adequate service for a reasonable period of time in advance. The various factors entering into this consideration are pointed out and explained by the author, and it is his endeavor to develop a rational basis for pursuing the subject. A formula for the economic current density in a cable has been developed on the basis of 100 per cent load factor and involves, at a rate of 12 per cent per annum, the capital charges on the cable, the uniform loss in watts, the additional cost of cable per ton of contained copper per mile, including all costs, and the weight of one mile of copper of 1 sq.in. cross-section. As the result of the investigation included in this study, the author concludes that no difficulty can be anticipated in supplying residential districts by cable to meet the demand of fully electrified homes, provided that the cost of energy does not exceed an amount which he mentions but which is only applicable to the peculiar conditions of English practice, and that the policy in regard to domestic supply rates is such as to develop the full demand within a few years.—*Electrician* (England), Sept. 2, 1927.

## *Generation, Control, Switching and Protection*

*Coupling Capacitors for Carrier-Current Applications.*—T. A. E. BELT.—Coupling to high-voltage transmission lines for purposes of carrier-current communication was first successfully made by means of coupling wires. This type of coupling usually required high-power transmitting equipment, but when coupling capacitors were substituted it was possible to reduce the carrier input to the line without affecting the received signal strength. This article gives an approximate method for determining the effectiveness of coupling wires and coupling capacitors. No attempt is made to achieve refinements in calculations as the desire has simply been to show the effect of stray capacity. Curves illustrating the change in practice from coupling wires to coupling capacitors are shown. It is estimated that by the early part of 1928 the total number of the two types of coupling will be equal. The electrical characteristics for different types of insulation used in coupling capacitors,




COUPLING WIRE AND CONDENSER TYPE CARRIER-CURRENT INSTALLATIONS

based on test results, are given. Some important points of design have arisen in connection with the new cable-type capacitor.—*Journal of American Institute of Electrical Engineers, October,* 1927.

*Study of Number of Tests Required to Establish Rupturing Capacity of an Oil Circuit Breaker.*—E. B. WEDMORE, W. B. WHITNEY and C. E. R. BRUCE.—An investigation of the degree of variation of results obtained in repeated tests in the simplest case of a single-break circuit breaker under fixed conditions of supply is reported in this article. Curves are given, based on a large quantity of data, showing the variations which occur in the individual maxima and means of arc energy in groups of repeat tests, and startling conclusions are drawn as to the prohibitively large number of tests necessary to establish a rating with any reasonable degree of accuracy by the generally accepted commercial methods of testing. On three-phase testing a slight reduction in the number of tests may be allowed, but this does not materially affect the general conclusion that the necessary number would be prohibitively large. A thorough investigation of all possible causes of variation, the development of formulas and the determination of constants by tests are stated as offering the only ways of solving the important and pressing problem of the rating of oil circuit breakers for the establishment of comparable bases.—*Journal of Institution of Electrical Engineers (England)*, October, 1927.

## *Units, Measurements and Instruments*

*Reduction of Transformer Exciting Current to Sine-Wave Basis.* — G. CAMILLI.—As a sequel to an earlier investigation and development of a method for the reduction of core-loss measurement to sine-wave basis, this paper describes two methods developed for the reduction of exciting current to the same basis. The first method consists of making two measurements at wave shapes as widely different as possible, setting the voltage in each case by means of the flux voltmeter. The current corresponding to sine-wave voltage is obtained by extrapolation from the observed values of currents and form factors. The method might be considered empirical, but it is said to have been found to yield an accuracy within 1 per cent even under extremely unfavorable conditions. The second method utilizes the flux voltmeter for setting the voltage but uses a "crest ammeter," developed for this purpose, for reading the instantaneous maximum values of the corresponding currents. Measurements are made at 100 per cent, 86.6 per cent and 50 per cent voltages. These data determine the fundamental third and fifth harmonics of the exciting current corresponding to sine-wave voltage, and hence the exciting current itself, because these harmonics are the only important components in determining the effective value of the exciting current. The theory of the crest ammeter is given, and its applicability in conjunction with the flux voltmeter to the determination of direct-current saturation curves by means of alternating-current tests in magnetic investigations is indicated.—*Journal of American Institute of Electrical Engineers,* September, 1927.

*Remote Position Indicator.* — P. M. PFLIER.—Varying water levels may be indicated, remotely, by means of an indicator of the induction type based upon the changing apparent resistance of a coil into which an iron core is introduced. Indications are rendered independent of voltage or frequency fluctuations through the introduction of two coils, one of them with a moving core, which are used with a bridge-connected, double-coil indicating instrument. The latter can be equipped with minimum and maximum alarm contacts.—*Siemens Zeitschrift,* July, 1927.

## *Motors and Control*

*Behavior of Rotary Converters on High-Tension Short Circuits.*—I. F. HILLEBRAND.—The increasing use of interconnection for large high-tension power systems is asserted by the author to lead to a factor of considerable importance in connection with the behavior of rotary converters connected

to the low-tension network of such systems and subject to the occurrence of disturbances on the high-tension side. It is stated that when a short circuit occurs on the high-tension network a drop in the voltage at the slip rings of the converter will always take place. The magnitude of this voltage drop depends to a large extent upon local conditions. It is assumed that with the direct-current side disconnected—that is, with the rotary running light—the falling off in voltage takes place with sufficient time delay so that no appreciable reverse current can appear. A careful analysis of operating conditions with oscillographic records has been prepared to illustrate fully the disturbances which take place with this type of equipment.—*A.E.G. Progress,* September, 1927.

*Prevention of Commutator Fire.*—G. JACOBY.—The author endeavors to explain so-called "round fire" on commutators of direct-current generators by the electron theory and the puncture of ionized air. Conditions for a flashover between commutator bars or between brushes are greatly aided by the configuration of the electrostatic field formed concentrically with the commutator. Metallic shields electrically connected to the brushes, and so fastened to the brush rigging of a machine as to surround the commutator, change the character of the formerly concentric field into a radial field. Mathematical investigations indicated and experimental tests proved that such an arrangement should materially lessen the flashover danger on railway generators and motors.—*Elektrotechnische Zeitschrift,* Oct. 6, 1927.

## *Heat Applications and Material Handling*

*Industrial Heating Control.*—P. H. CLARK.—The general subject and the problems involved in industrial heating by electricity are outlined and discussed in this article. The temperature-control instruments generally used for industrial electric heating may be classified according to the following types: Mechanical, expansion, pyrometer, millivoltmeter and potentiometer, the latter being used with thermocouples. The advantages and applications of these various types of instruments are discussed. The control panel and the devices used for overload protection, door switches and temperature-limit fusing are all mentioned. Because electric service is a high-grade service and because a considerable distance with unavoidable losses intervenes between the points of its origin and utilization, electricity purchased for its B.t.u. content costs more than the thermal equivalent in fuel substances. The cost per B.t.u. is often of less consequence than quality of heat-treated products. This discussion is directed toward a consideration of some of the special problems connected with the electric furnace.—*General Electric Review,* September, 1927.

## *Electrophysics, Electrochemistry and Batteries*

*Errors in the Magnetic Testing of Ring Specimens.*—EDWARD HUGHES.—The usual practice of making the ratio of the radial thickness to the mean diameter of a ring about one-tenth to one-fifteenth, in order to limit the error due to non-uniform flux distribution, is stated to involve errors due to the assumption of constant permeability by a previous investigator who calculated the errors involved in the determination of the magnetization curve and of the hysteresis loss for various ratios of radial thickness to mean diameter. It is shown in this paper that when the variation of permeability is taken into account the errors involved in the determination of the above-mentioned quantities are almost invariably either smaller or larger than those calculated under earlier assumptions. The influence of the ratio of radial thickness to mean diameter and of reluctivity upon the relationship between the average flux density in the ring and the flux density corresponding to the average magnetizing force, the relation between the actual hysteresis loss in the ring and the hysteresis loss in the same volume of iron owing to the flux density corresponding to the average magnetizing force, and the relationship between the true hysteresis coefficient and that determined from a test performed with an alternating-current supply or a ballistic galvanometer, are discussed. Reference is made to the desirability, under certain conditions, of using a higher ratio of radial thickness to mean diameter than is customary in order that any error due to mechanical strain produced by punching and similar factors may be reduced.—*Journal of Institution of Electrical Engineers (England),* October, 1927.

*Non-Harmonic Alternating Currents.*—FREDERICK BEDELL.—The author has presented certain principles for solving non-harmonic alternating-current problems. Graphical methods have been developed for solving practically any problem, when current and electromotive forces are sinusoidal, by vector diagrams in a plane. The author states that in certain special cases such diagrams give correct results when currents and electromotive forces are non-sinusoidal, but that in general diagrams in more than two dimensions are necessary. A wide range of material, some of which has been published before in scattered places, is brought into relation; no single general solution is anticipated. The factors included are the principle of independent superposition of harmonic alternating currents of different frequencies, the copper saving in composite systems, the equivalent sine waves, equivalent phase difference and a special case in connection with systems when the power factor is less than unity. The author concludes that plane diagrams are subject to the gravest errors in case of circuits containing inductance and capacity, when resonance for a particular harmonic may greatly amplify the errors due to wave distortion.—*Journal of the American Institute of Electrical engineers,* October, 1927.

## *Telegraphy, Telephony, Radio and Signals*

*High-Voltage Direct-Current Generators.*—E. RAPPEL.—The high-voltage direct-current generator has become of great importance for the supply of anode potential in transmitting tubes of radio stations. The author describes modern requirements and up-to-date designs. The winding, the connection, the commutation and the cause and suppression of higher harmonics are discussed in detail. Data are given of a 3-kw., 3,000-volt, 1,500-r.p.m. motor-generator set, built by a Swedish concern, which is in daily use at the Falun radio station. The generator was tested with 9,000-volt, 50-cycle alternating current and gives excellent commutations up to 4,500 volts at 125 per cent rated current. It is stated that no commutator ripple can be detected by headphones on the current from this generator.—*Elektrotechnische Zeitschrift,* Sept. 8, 1927.

## *Miscellaneous*

*Recent Developments in the Application of Anti-Friction Bearings to Machine Tools.*—R. F. RUNGE.—The application of anti-friction bearings to such parts as milling machine, lathe grinding wheel and work-head spindles on various types of machinery has been cautiously approached. This has been due, according to the author, to the requirements of high accuracy of performance and also to certain failures during past years in bearings which had not been developed to so high a standard as those available at present, improper types as well as faulty mountings being used. The problems mentioned are those which must be encountered in the proper design of machines in which anti-friction bearings are to be installed, particularly with regard to proper allowances for axial and radial movements of the bearings without destroying the high degree of mechanical accuracy necessary. Consideration is also given to the problem of proper lubrication for ball bearings. The author concludes that satisfactory results can be achieved only by a careful analysis of the conditions to be met in the various types of machines, that full advantage should be taken of the information the bearing manufacturers are in a position to supply, and that standardization should be kept definitely in mind. It is stated that the initial installation of ball bearings, if made standard practice on machine tools, may show a higher cost than many of the present types of sliding bearings and lower maintenance costs will be encountered.—*Mechanical Engineering,* September, 1927.

# News of the Industry

## Jordan Dam Dedicated

*Largest Private Hydro-Electric Plant in the South Initiated on Coosa River with Appropriate Program—Mitchell Brothers Honored*

IN THE presence of thousands of citizens, executive officers of the commonwealth, financiers, industrial and civic leaders from various districts of Alabama, as well as leaders from New York, Boston, Philadelphia and other cities, the largest privately owned hydro-electric development in the South—that of the Alabama Power Company at Lock 18 on the Coosa River—was dedicated on Monday of this week. The event marked progress toward the realization of an undertaking that will play a large part in the industrial growth of the state and bring about a thickly populated territory. The project—named Jordan Dam for Elmira Sophia Jordan Mitchell, mother of Col. Reuben Alexander Mitchell, vice-president of the Alabama Power Company, and Sidney Zollicoffer Mitchell, director of that company and president of the Electric Bond & Share Company—was dedicated to the Mitchell brothers in recognition of their services to the electrical industry. One of the features of the dedication was the conferring of the degree of doctor of laws on Sidney Z. Mitchell by Dr. George H. Denny, president of the University of Alabama.

Thomas W. Martin, president of the Alabama Power Company, reviewed the history of the locality and the early life of both the Mitchells and then told what power meant to the state. Other speakers were Lewis E. Pierson, president of the United States Chamber of Commerce; Col. R. A. Mitchell, Dr. Denny, Owen D. Young, chairman of the General Electric Company board; S. Z. Mitchell and Congressman William B. Bowling of Lafayette, Ala.

Unveiling of a temporary replica of the Jordan Dam Memorial, a beacon shaft 41 ft. high, by Fern W. Mitchell, twelve-year-old grandson of Col. R. A. Mitchell, was a feature in the proceedings. The permanent shaft will be of blocked granite and situated in the center of a landscaped circle surrounded by a paved driveway and walkway. Operating from the top of the shaft, a search-lamp will aid night-flying aviators. The shaft itself will be brilliantly floodlighted.

The Jordan Dam site, 18 miles below Mitchell Dam and 20 miles above Montgomery, was selected by the Corps of Engineers, U. S. A., and is one of a series of dams of certain heights and specified locations which have for their purpose improvement of navigation on the Coosa and Alabama Rivers from Rome, Ga., to the Gulf of Mexico, the development of hydro-electric power and flood control. The dam will be 1,680 ft. long, 103 ft. high to the crest and 125 ft. to deck, and will contain seventeen gates and a 724-ft. open spillway. The operating head will be 93 ft. In the power house, 300 ft. x 61 ft., will be installed four 36,000-hp. turbo-generators, making an initial capacity of 144,000 hp., ultimately to be raised to 216,000 hp. The development, which will be the largest hydro-electric plant in the South with the exception of the government plant at Wilson Dam, will create a navigable slack-water pool extending to Mitchell Dam, which, combined with the pools formed by Mitchell Dam and Lock 12, will make navigable a total of 60 miles of the Coosa River in which the natural fall is 233 ft. The plant is scheduled for completion in the fall of 1928.

## Alabama Power Company's New Steam Plant

The first large single-cylinder turbo-generator for service south of the Mason and Dixon line is now being manufactured in the Schenectady shops of the General Electric Company. Rated at 60,000 kw., this unit will be the first one installed in the station being built for the Alabama Power Company by the Dixie Construction Company near the site of the present Gorgas station in the Warrior coal fields of Walker County. The ultimate capacity of the new station will be 240,000 kw., and it will involve an investment of about $20,000,000.

The turbine of the new unit will operate at a steam pressure of 400 lb. gage, at a temperature of 725 deg. F.

## Louvain Memorial to American Engineers in World War

Referring to the clock and carillon which are to be installed in the library tower of the University of Louvain, Belgium, as a memorial to United States engineers who died in the World War, Alfred D. Flinn, director of the Engineering Foundation, said this week that 56,000 engineers scattered through the 48 states were raising $80,000 to make the memorial possible. The fund is sponsored by the committee on war memorial to American engineers, of which the chairman is Dr. Edward Dean Adams, the other members being George W. Fuller, American Society of Civil Engineers; Colonel Arthur S. Dwight, American Institute of Mining and Metallurgical Engineers; Arthur W. Berresford, American Institute of Electrical Engineers; Charles M. Schwab, American Society of Mechanical Engineers, and George Gibbs, United Engineering Society.

## National Presidents Issue Joint Letter to Industry

*Sands, Swope, Cullinan, Chamblin, North and Freeman Unite in Announcing Reorganization of Society for Electrical Development*

FOR the first time in history the presidents of the four major national associations of the electrical industry united last week in issuing an official announcement to the industry. This statement, which was also signed by the respective heads of the League Council and the Society for Electrical Development, concerned the recent reorganization of the last-named body, which has already been recorded in the ELECTRICAL WORLD. The announcement is dated Nov. 17 and reads as follows:

The four major national associations and the leagues of the electrical industry take this means of announcing through their presidents the successful consummation of the reorganization of the Society for Electrical Development. The need for an effective co-ordination of the association work of the four branches of the industry is self-evident. The society was conceived and established to promote co-operation in the industry and stimulate the electrical business. But it was a loose pulley, not belted to the organized industry, and for years it has struggled under this serious handicap.

Now the industry comes to a new era in which it must look for its growth to a more intensive development of markets, in the face of the keenest competition by other industries. It needed a more effective national leadership, tied in more closely with the local leagues. And so the board of directors of the S.E.D. has been recast and is now composed of the presidents, managing directors and other representatives of the major national associations and the League Council, together with other prominent executives drawn from all branches of the industry. This directorate, therefore, has become an industry forum—definitely providing for future harmony of action and the co-ordination of industry purposes. The S.E.D. staff becomes available as the central service organization to function for the industry in carrying out national programs as they are agreed upon.

The society has been successfully refinanced. Its organization and activities have been carefully studied by planning committees appointed by the associations and the leagues. It is ready to embark on an all-industry program with splendid promise. Such a program will be considered by the industry sales conference convening on Nov. 21. There is every prospect that the industry may soon embark upon a broad movement of market development.

This joint announcement is sent to you as the best evidence of the solidarity of the industry in this reorganization of the Society for Electrical Development and in the more active program of industry promotion which is to follow. We appeal for your complete confidence in the new-born society

and bespeak your attention, your interest, your co-operation and your support.

This announcement bears the signatures of Howard T. Sands, president National Electric Light Association; Gerard Swope, president National Electrical Manufacturers' Association; George E. Cullinan, chairman executive committee Electrical Supply Jobbers' Association; C. L. Chamblin, president Association of Electragists International; J. E. North, chairman League Council, and W. W. Freeman, president Society for Electrical Development.

## Herminghaus Suit May Be Adjusted

Negotiations are under way for a settlement out of court of the Southern California Edison Company's condemnation suit against the Herminghaus estate, according to a statement made recently by Edward F. Treadwell, chief counsel for the Edison company in this case. The action in the State Supreme Court at this time is one in which the Edison company sought to condemn the Herminghaus lands as a means of obtaining the necessary water to operate hydro-electric plants in the High Sierras east of Fresno. This condemnation suit is the aftermath of the decision sustained by the United States Supreme Court in which the company was restrained from interfering with the natural flow of the San Joaquin River by impounding water which, the court held, would interfere with the riparian rights of the Herminghaus heirs to an unrestricted flow of the San Joaquin River past their lands in Fresno and Madera Counties.

## Industry Sales Conference Is Organized

Announcement is authorized by the Electrical Industry Sales Conference of the following action taken on Nov. 21 during its opening session in New York:

W. E. Sprackling was elected chairman of the conference, George E. Cullinan vice-chairman and Kenneth A. McIntyre secretary. An executive committee composed of the chairmen of the five delegations was named and includes: W. E. Sprackling, National Electrical Manufacturers' Association; G. E. Cullinan, Electrical Supply Jobbers' Association; J. E. Davidson, National Electric Light Association; Joseph A. Fowler, Association of Electragists International, and J. E. North, representing the leagues.

To approach its broad work in a definite way, the conference adopted the following resolutions:

That the industry sales conference make as its first objective the development of a broad industry program for the promotion of more adequate house wiring through an organized national movement to rewire the houses now connected to the power systems of America where the installations provide inadequate facilities for the use of complete electrical equipment and also to establish a higher standard of adequacy in the wiring of new houses.

That the conference recognizes that the present status of the electrical house-wiring contractor will prove a fundamental factor in the carrying out of any program to promote house wiring and that careful study should be given to this problem in the hope that a way may be found to increase his effectiveness as a creative influence in the development of the electrical market.

Sub-committees composed of the following men were appointed and will report their recommendations to the next meeting of the conference in January, 1928:

Committee on wiring (to include also "red seal" and rewiring)—M. C. Huse, chairman; A. Lincoln Bush and R. Bourke Corcoran.

Committee on the contractor-dealer situation—W. Creighton Peet, chairman; John L. Owen and Earl Whitehorn.

Committee on national financing and local co-operation—H. T. Bussman, chairman; R. J. Russell and D. C. Birdsell.

Committee on national advertising—J. E. Davidson, chairman; R. Bourke Corcoran and G. E. Cullinan.

Committee on merchandising—J. G. Johanneson, chairman; E. W. Lloyd and J. L. Ray.

Committee on S.E.D. co-operation—J. E. North, chairman; James A. Strong and H. A. Brooks.

## Rating of Fractional Motors Discussed at Cleveland

At the meeting of the joint committee on fractional-horsepower motors which was held in Cleveland, Nov. 17, about sixty representatives of motor manufacturers, appliance manufacturers and light and power companies were present. The meeting was called to continue the work started last spring at Detroit, where specifications were agreed upon for the ¼-hp. motor. The discussion at Cleveland dealt with proposals to agree upon ratings for all sizes of fractional-horsepower motors. Market demands indicated two general classes—one of a high-efficiency type for long-hour service and one of lower efficiency and lower price for short-hour use.

Discussion dealt with classifying the two types of motors and with ratings for them. It developed that a possibility existed for rating each class for the same power factor, so that a relative difference in efficiencies and cost would be their distinguishing feature. The economics of business would then tend to force the use of the two types in their proper applications. Agreement was general that refrigerator and oil-burner motors would all fall in the high-efficiency class. As a definite step to a conclusion on ratings the representatives of the motor manufacturers agreed to present data in detail on both classes of motors at the next meeting of the committee. This meeting will be held in Cleveland early in December, and the committee feels that, with these data available, it will be possible to reach agreement.

Other points canvassed last week were possibilities for increasing the efficiency of appliances as well as motors, the problem of old houses which are inadequately wired, starting-current specifications and utility policing methods.

## Utilities at New England Conference

*Flood Control Discussed—Status of Exportation of Hydro Power from Maine —Interconnection and Rural Service Are Making Progress*

PUBLIC utility activities again occupied a prominent place on the New England Conference program on Thursday and Friday of last week, when the third meeting of this important group of Northeastern agricultural, industrial and business interests took place at Springfield, Mass.

President H. I. Harriman of the New England Power Association made an address upon the success of flood control in the Deerfield River Valley of Vermont during the recent deluge and pointed out that plans are afoot for building two additional storage reservoirs in the Fifteen-Mile Falls section of the Connecticut River during the next few years, so that flowage control may be greatly improved on the latter stream. He said that during the recent flood the storage of the upper Connecticut lakes resulted in comparative freedom from damage for 75 miles south and said that on the Connecticut about 30 sites are available for storage-basin construction. Walter S. Wyman, president of the New England Public Service Company, described the helpfulness of storage on the Androscoggin River during the recent storm. At Gulf Island, near Lewiston, Me., the maximum flow was about 60,000 sec.-ft., or some 2,000 sec.-ft. greater than records as far back as 1896, but the dam and hydraulic installation could have handled double this flowage without damage. The speaker emphasized the need of still greater storage on both the Androscoggin and the Kennebec River.

Progress in negotiations leading toward the establishment of a basis on which surplus hydro-electric energy may be exported from Maine was reported by Mr. Wyman, who stated that representatives of the New England governors are at present considering a memorandum drawn up through the co-operation of the power companies and setting forth the major points to be met in the investment of capital in interstate transmission.

For the New England Council's co-operating committee on power, Samuel Ferguson, president Hartford Electric Light Company, recounted progress in the study of the economics of rural electrification, in the practice of power interchange through interconnection, and in the development of industry in New England with central-station help.

At a special flood session Friday afternoon, Secretary of Commerce Hoover addressed the conference upon the problem of relief and reconstruction in Vermont and northern New Hampshire. To a representative of the ELECTRICAL WORLD Mr. Hoover declared that utility companies in all parts of the country owe to high-grade engineering and construction much of their success in passing through disasters well.

## Virginia Commissioner on Federal Encroachment

*Lester Hooker, Defending State Jurisdiction, Criticises Water-Power Act at State Utilities Convention—Head for Information Bureau Appointed*

INFRINGEMENT by the federal government upon the powers of the states has become so serious that the balance of power between national and state governments which the constitution sought to create is being destroyed, Lester Hooker, member of the Virginia State Corporation Commission, declared in an address at the annual convention of the Public Utilities Association of Virginia, which was held on Nov. 17 and 18 at the Jefferson Hotel, Richmond. Mr. Hooker asserted that the continual overlapping of the jurisdiction of the federal government on that of the various states has grown to an "alarming extent." A national awakening is needed to restore the functions of the federal and state governments to their proper equilibrium, he said.

Mr. Hooker's address was on "Water Power—Its Control," and most of it was devoted to a discussion of the federal water-power act, which he cited as an example of dangerous encroachment by the national government upon state prerogatives. "The generation of electrical energy is not commerce between the states," Mr. Hooker said. "It is the production of power as the result of human skill and machinery and may or may not become an element of commerce and thereby subject to federal jurisdiction. A legal definition for commerce as given by the Supreme Court is to the effect that it 'consists of intercourse and traffic, including in these terms navigation and transportation and transit of persons and property, as well as the purchase and sale and exchange of commodities.' Certainly it is clear that the generation of electric power is production, and, like other products in which the public has an interest, that its regulation and distribution are within the jurisdiction of the state. Under the constitution Congress cannot say to a sovereign state that it must appeal to an agency created by the federal government for permission to develop power upon a stream within its own jurisdiction."

Addresses also were made by William E. Wood of Richmond, retiring president of the association and president of the Virginia Electric & Power Company, on "Co-operation in the Industry"; Prof. Charles E. Seitz of the Virginia Polytechnic Institute at Blacksburg, on "Results of the V. P. I.'s Work in Virginia"; C. W. Kellogg of New York, president of the Engineers' Public Service Company, on "The Financial Corporate Set-up of Public Utilities"; C. S. Stackpole, sales manager of the Virginia Electric & Power Company, on "Merchandising Our Service"; Herbert Markle, general manager of the Appalachian Electric Power Company, on "Advantages and Possibilities of Electric Power Line Interconnections"; Dr. F. H. Newell of Washington, D. C., president of Research Service, on "Rural Lines — Decentralizing Industry"; T. Norman Jones, Jr., general manager City Gas Company, Norfolk, Va.; James B. Wootan of Chicago, editor of the *Public Service Magazine*, on "The Power of Leadership"; J. Scott Parrish, former president Richmond Chamber of Commerce, and A. W. Higgins, general manager of the Virginia Public Service Company. Congressman Andrew Jackson Montague of Richmond and Prof. Theodore J. Grayson of the University of Pennsylvania addressed the annual banquet. Professor Grayson opposed federal control or regulation of utility companies.

About 150 members of the association, representing all of the public utility companies in the state, were in Richmond to attend the convention. New officers were elected as follows: President, John W. Hancock of Lynchburg, Appalachian Electric Power Company; first vice-president, W. A. Higgins of Charlottesville, Virginia Public Service Company; second vice-president, W. J. McCorkindale, manager Roanoke Gas Company; treasurer, A. H. Herrmann, Virginia Electric & Power Company. The new office of full-time secretary and head of the Public Service Information Bureau was established, with Allyn B. Tunis, a Richmond newspaper man, as incumbent.

## Tax on Municipal Utilities Rejected at Washington

The United States Treasury Department is reported to have turned down the proposal of Collector of Internal Revenue McLaughlin of San Francisco

## New England Public Service Company's New Home at Augusta, Me.

A FINELY appointed office building containing about 25,000 sq.ft. of floor space has recently been completed at Augusta, Me., for the New England Public Service Company and Central Maine Power Company. The new home of these properties is 170 ft. long and 40 ft. wide, containing three stories and a basement. It is within a few steps of the business center of the city and on the border of a residential section with which its architecture harmonizes effectively. Besides containing commodious quarters for executives, engineering, sales, accounting and operating staff members, the building is provided with attractive space for visitors, clubs and rest rooms for employees, library, stock room, department of public information, security sales, an assembly hall and load-dispatching office for the entire system.

that the income from San Francisco's municipally owned utilities be taxed under the income-tax law. The collector proposed to levy a tax of 13½ per cent on the net earnings of a bus line, the city-owned street-car system and the Moccasin power plant. So far as the bus lines are concerned, the government has demanded and will receive a tax payment of $900 under protest from the city on earnings from July 1, 1920, to June 30, 1924.

The move to tax all municipal utilities is said to have been started by Mr. McLaughlin, but, because of instructions from Washington, he will not attempt to levy the tax except on the bus lines.

## Purchases and Mergers

The Mohawk-Hudson Power Corporation has made application to the New York Public Service Commission for authority to acquire all of the outstanding capital stock of the Schodack Light & Power Corporation, which supplies electricity in Castleton and the town of Schodack, N. Y.

I. C. Elston, Jr., Chicago, has made cash offers for the Luverne, Worthington and Adrian (Minn.) electric power plants and distribution systems. The city of Luverne has been offered $135,000 for its system, Worthington $250,000 and Adrian $65,000. No action has been taken by the municipalities yet.

The Missouri Edison Company of Louisiana, Mo., which operates several public utilities in northeast Missouri, has applied to the Missouri Public Service Commission for authority to buy electric properties in Silex, Elsberry, Annada, Paynesville, Curryville, Turpin, Dameron and Whiteside from A. H. Latimer and James W. Peterson for $58,000 and other legal considerations.

The New Hampshire Public Service Commission, having denied the petition of the Parker-Young Company of Lincoln to acquire the properties of the Fox and Putnam interests and to extend its transmission lines into the towns of Woodstock, Thornton and Campton, has now granted all of the privileges petitioned for by the Parker-Young interests to the Baker River Light & Power Company, which will start to build lines into Woodstock at once.

The Municipal Gas and Electric Light Department, Holyoke, Mass., has plans to purchase the Hadley plant of the American Thread Company, involving water and power rights and eleven small generating units.

In a closely contested special election at New Braunfels, Tex., it was voted by 513 to 493 not to sell the municipal electric light system.

The Goldthwaite (Tex.) light and ice plant has been sold to the Texas-Louisiana Power Company.

During the past six months public ownership of electric utilities has gained in favor in several Oregon districts. Closely following a refusal of the citizens of Bandon to sell their municipal plant for $120,000 to private operators, the town of Milton announced the intention of constructing and operating a hydro-electric plant. The city of Hood River is now contemplating the construction of a hydro system and municipal transmission lines, while Brookings is proposing to install a gas-engine power plant to generate power for the community.

# Wisconsin Commercial Men Study Load

### Two-Day Meeting at Milwaukee Taken Up Largely by Discussion of Methods to Broaden Electric Service to Industry and to the Home

THAT it is high time for central-station companies to consider their sales activities in the broader aspects of complete electric service, rather than as the sale of raw kilowatt-hours or the merchandising of appliances alone, was the consensus of opinion of those who attended the two-day convention of the Wisconsin Utilities Association's Commercial Section held at the Hotel Pfister, Milwaukee, on Nov. 17-18. Load building, load-factor improvement and a fuller conception of the utilities' service to the home were enumerated by Chairman M. S. Bandoli as the leading problems confronting utility commercial men.

Power companies must do more than merely pioneer the development of new devices and applications of electrical equipment, F. A. Coffin, sales manager Milwaukee Electric Railway & Light Company, declared. Admitted, he said, that it is their obligation to bring electrical processes to the point of general acceptance, they cannot afford to stop there but must recognize that consumer acceptance is not a permanent thing to be achieved and then retained without further effort.

Electric refrigeration constitutes one of the largest markets for kilowatt-hour sales before the electrical industry, it was pointed out in the report of the electric refrigeration committee, of which F. H. Evans was chairman. Large-capacity installations, such as ice and cold-storage plants, involve 200 kw. demand and 750,000 kw.-hr. annual consumption. Medium-size installations in hotels, clubs and warehouses involve demands of 2 kw. to 10 kw. and use from 7,500 kw.-hr. to 40,000 kw.-hr. per year. In the domestic field the demand is from 200 to 300 watts and energy consumption is from 800 to 1,000 kw.-hr. annually. Satisfactory equipment for all three groups of application are now available. Adequate inspection of new installations, particularly those of the multiple type, a flat charge for servicing and correct recommendations for the installations of self-contained cabinets or remote compressors were suggested by J. W. Hill of Milwaukee as requiring further study.

In discussing a permanent plan for electric merchandising, E. C. Sorby, Wisconsin Power & Light Company, presented an analytical study of central-station sales methods considered under three general topics, the salesman, the store and sales policies. Practical policies with respect to terms, prices, campaigns, advertising, demonstrations, etc., were explained.

As illustrative of the possibilities of the industrial electric heating load, O. O. Wagley presented data showing how energy sold for this purpose in Milwaukee and vicinity had increased from 20,000,000 kw.-hr. in 1921 to 100,000,000 kw.-hr. in 1926. This class of business is assuming large proportions but is still far from the saturation point. In Milwaukee and adjacent territory possibilities of electric heating load are believed to be 600,000,000 kw.-hr. a year.

H. W. Beckwith, Lake Geneva, chairman of the power committee, presented a report on domestic electric heating and cooking which stressed the fact that those utilities which are slow to develop the electric range and water-heating load may suddenly wake up to find that other competitive fuels are so strongly intrenched that development of this business will be difficult.

Speaking briefly before the meeting, Earl Whitehorne, commercial editor of the ELECTRICAL WORLD, asked for a more comprehensive attitude in developing residential load. The electrical industry generally is afraid to ask a customer to buy more than one thing at a time, he declared, and thereby is failing to meet the competition of other merchants and industries.

Better advertising by utility companies was the theme of an address, "Speaking Our Piece," by Fred E. Erickson, Milwaukee. Men in charge of the preparation of advertising copy for the power companies should serve also in an advisory capacity in the formulation of sales plans, he said.

Rural electrification may mean much or little, depending at this time upon the proper commercialization of the farm, declared G. V. Rork, Owen, who urged that central-station commercial men undertake the more intensive development of the farm load.

Home-service work occupied a conspicuous place on the program and under the guidance of heads of home service departments and women employees of the utilities is playing an important part in commercial development. Related papers on this subject were presented by five utility women.

Branding government ownership as a menace to American prosperity, J. Victor Loewi, financial editor the Milwaukee *Sentinel*, declared that the public utility industry must assume the responsibility of protecting the people against politics in business.

Other papers were presented as follows: "Co-operation with Dealers," John F. Martin, Ashland; "Better Customer Relations," J. J. Feeney, Madison; "Merchandising Results Obtained Through Co-operation of All Employees, Albert Smith, Chippewa Falls, and "Developing Appliances to Meet Popular Demand," John A. Clark, Mansfield, Ohio. The lighting committee report was made by O. J. Kruse, Milwaukee.

F. A. Coffin of Milwaukee was elected chairman of the Commercial Section and E. R. Felber, Madison, vice-chairman for the ensuing year.

## Walsh Explains Scope of His Resolution

*Montana Senator Stresses the Financial Aspect of Contemplated Inquiry Into the Utility Industry by Committee of Upper House*

MAKING it apparent that the points which he wishes to have investigated in connection with the development of utility companies in the United States are largely those concerning the financing of holding companies and the merging of local utility companies into groups, Senator Thomas J. Walsh of Montana made an oral statement in Washington on Nov. 16 in which he said: "The Federal Trade Commission has narrowed the field somewhat by giving facts on the so-called power trust, but the material developed there will afford us a basis for inquiring into what has happened in the strictly financial side of the industry."

Referring to cases of which he has been advised, Senator Walsh continued: "Either the properties were bought at sums that make it necessary for the present rate schedules to be maintained at a cost to the consumer that should come down, or else the investor has been asked to buy securities which by reason of the high prices paid for the properties will not mean the payment of early dividends. It is our task to bring these facts to light for the protection of the public. The various state commissions will be much interested, I am sure, in what is brought out.

"It is not my purpose to recommend federal regulation," asserted the Senator. "I haven't any such idea in mind, nor am I pointing toward government ownership. I cannot say what recommendations will be made, and I am not even sure that we can correct some of these abuses by legislation, but I am anxious that the country shall have the facts, on which interested groups can base their action before state commissions or elsewhere. We are going to invite students of the public utility field, engineers, financiers and all who can throw light on the subject to testify."

By the terms of the resolution to be introduced by Senator Walsh into the Senate soon after its assembly next month, and almost certain to pass, the committee of investigation into the electric light and power industry and the gas industry will be composed of five members of the Upper House. The resolution, which was introduced first in the last Congress just before its close in March, reads as follows:

Resolved, That a committee of five members of the Senate be appointed by the President thereof, hereby empowered and directed to inquire into the growth of the capitalization of public utility corporations supplying either electrical energy in the form of power or light or both, however produced, or gas, natural or artificial, and of corporations holding the stocks of such corporations, the method of issuing and the price realized or value received for the various security issues of both classes of corporations named, including the bonds and other evidences of indebtedness thereof, as well as the stocks of the same, the extent to which additions or extensions to the property of the operating companies have been made, and the value or detriment to the public of holding companies owning the stock or otherwise controlling such operating companies immediately or remotely, with the extent of such ownership or control, and particularly what legislation, if any, should be enacted by Congress to correct any abuses that may exist in the organization or operation of such companies.

That the said committee is hereby authorized to sit and perform its duties at such times and places as it deems necessary or proper, and to require the attendance of witnesses by subpoenas or otherwise; to require the production of books, papers and documents and to employ counsel, experts and other assistants and stenographers, at a cost not exceeding $1.25 per printed page.

The resolution then gives certain other powers to the committee to conduct its investigations.

## For Umatilla Rapids Plant

*Oregon Association Favors Federal Government Development on Columbia River at Initial Cost of $45,000,000—Ultimate Horsepower 420,000*

DEVELOPMENT of the Umatilla Rapids project on the Columbia River by the federal government will be urged before the next Congress through the McNary-Sinnott bill, which will be supported and pressed by a committee of Oregon citizens appointed from the Umatilla Rapids Association at its annual meeting in Pendleton, Ore., Oct. 27. The Umatilla Rapids project, as contemplated in the bill, provides for canalization of the river at the rapids, making navigation possible as far as the mouth of the Snake River, the reclamation of a vast acreage of arid land and the ultimate development of 420,000 hp. of electrical energy.

The terms of the bill provide for the construction of the project on the unit basis and authorize an initial bond issue of $45,000,000 to be paid for out of the sale of electrical energy. It was pointed out at the association meeting that should the bill pass and the project be started in 1928, it would be 1937 before any power would be available and that this first unit would be limited to 31,000 hp. Twenty years would be required to complete the entire development, and reports presented to the association indicated that by that time the needs of various communities within transmission distance of the site would be more than sufficient to absorb the entire output of energy. The intention of the advocates of the project is that the government should sell the energy to existing power companies and to municipalities at the busbars of the generating station, where, it is contended, the generating cost will be extremely low in comparison with other hydro-electric developments.

Marshall Dana of Portland was elected president of the Umatilla Rapids Association, and J. N. Teal of Portland chairman of the executive committee. There are vice-presidents from Oregon, Washington and Idaho.

## Nebraska Commission Disagrees with Senator Howell

In passing upon an application of the Omaha Railway & Bridge Company for approval of a refunding bond issue of $2,000,000, the Nebraska State Railway Commission apruptly refused to consider original cost plus additions and betterments as a controlling factor in determining the present fair value of the property of a public utility. An argument in favor of this method had been presented to the commission by United States Senator R. B. Howell, who was understood by the commission to contend that it should ignore Supreme Court decisions of recent date which make reproduction new less depreciation a vital factor and keep on writing decisions without regard to this measure of value in the hope that the higher courts will change their viewpoint.

"We decline to follow this astounding suggestion," the commission said in its decision. "We shall be guided, as heretofore, by the decisions of the Supreme Court of the United States and the Supreme Court of Nebraska. We shall not take time to discuss our duties at length, but shall simply say that to follow the suggestion would require a violation of our official oaths. It is the expression of an idea subversive of all government."

The commission holds that its jurisdiction arises solely under the Nebraska stocks and bonds act, which makes it its duty, when such an application is before it, to grant the plea if the property is sufficient in value, if the application correctly states the needs of the company and if the bonds and stock of the corporation bear a proper relationship to each other. In the case at issue it found these things to be true and granted the application.

## Speaker Longworth's Views on Boulder Dam

Speaker Nicholas Longworth in a recent statement said that he considers the Boulder Dam project involves a principle, like the flood-control plan, of such general importance as to constitute a national question. It should not be complicated by having the government go into the water-power business, he maintained. Speaker Longworth has recently visited the Pacific Coast, where he met a delegation of business men for a discussion of the Boulder Dam project.

"There are two important factors to be taken into consideration in connection with the development of the Boulder Dam project," he said. "These are the bearing it has on flood control and the irrigation aspect of that project. I think Boulder Dam legislation should be passed by this session of Congress in some form or other, in order to provide relief for the people in the Imperial Valley and to take care of needed water supply for Los Angeles and that section of the country. I believe that these two things can be accomplished without getting into water-power complications."

# Briefer News

CONFERENCE ON WELDING AT PURDUE NEXT MONTH.—The third annual conference on welding will be held at Purdue University, Lafayette, Ind., on Dec. 13-15 under the direction of the university's departments of engineering extension and practical mechanics with the co-operation of manufacturers of welding equipment. Prof. W. A. Knapp will be in charge.

MOORHEAD, MINN., MUNICIPAL PLANT TEN YEARS AHEAD OF ESTIMATE.—Hundreds of persons have visited the new municipal plant at Moorhead, Minn., which has been remodeled at a cost of $140,000 and is the nucleus of a half-million-dollar light and water system. The plant is now operating on a basis of work which engineers are said to have estimated two years ago would be reached in 1938.

NORFOLK'S NEW GENERATOR WILL START UP NEXT MONTH.—The five-million-dollar addition to the Reeves Avenue power plant of the Virginia Electric & Power Company at Norfolk, Va., will go into commission early in December, it has been announced by Vice-President Thomas P. Walker. The additional equipment, which will almost double the generating capacity of the Norfolk plant, consists of a 30,000-kw. turbo-generator with boilers and auxiliary apparatus. It makes this the largest electric generating station in Virginia. Power will be furnished by it to the interconnected lines of the company in Virginia and North Carolina.

SALT LAKE CITY BEGINS ORNAMENTAL LIGHTING IN RESIDENTIAL DISTRICT.—Salt Lake City's first ornamental residential street-lighting system has just gone into operation in the northeast section of the city, known as Bonneville on the Hill. It consists of 56 standards of the old English horned or spiked lantern type, of pressed steel, 11 ft. 6 in. high, with 250-cp. lamps. The standards are spaced 130 ft. apart, staggered on each side of Arlington Drive and Circle Way, a distance of about seven blocks. Similar installations in other sections of the city will eventually be made. The system is of General Electric design.

INTERCONNECTION OF ONTARIO HYDRO SYSTEMS CONTEMPLATED.—A big tie-up of the hydro-electric plants operated by the Ontario Hydro-Electric Power Commission is contemplated in the announcement recently by the commission that it is in the market for the purchase of from 60,000 hp. to 100,000 hp. It is stated that the intention of the commission, if it can purchase the necessary power, is to link together its plants in the Trent, Rideau, Ottawa and St. Lawrence districts for the purpose of having a direct supply of power distributed from the combined plants where required in eastern Ontario. At present the commission has a number of generating plants in the four districts named, especially in the Trent and St. Lawrence districts, which are operating as separate units.

OKLAHOMA PUBLIC SERVICE COMPANY CELEBRATES PLANT OPENING.—The Public Service Company of Oklahoma was host at a dinner at Tulsa on Nov. 12 to the personnel of the company, contractors on construction and visiting representatives of light and power companies in celebration of the opening of its generating station at Weleetka. The plant has an initial capacity of 15,000 kw., the first unit of a 50,000-kw. installation. It is interconnected with the central power station of the company at West Tulsa.

CENTRAL-STATION PRODUCTION OF ELECTRICITY IN THE UNITED STATES CENTERS SOUTHWEST OF CHICAGO.—The center of production of electricity by public utility power plants in 1907 was in Lake Michigan about 45 miles northeast of Chicago. In 1917 the center was about 65 miles west by north of Chicago, having moved about 85 miles in a southwesterly direction in the ten-year period. In 1926 it was 55 miles west by south of Chicago, having moved about 20 miles in a southeasterly direction. These figures, computed by A. H. Horton of the United States Geological Survey, show a relatively small movement of the center of output since 1907 and are therefore an indication of the general and approximately uniform increase in utilization of electricity in all parts of the country.

SPRINGFIELD (MASS.) OFFICIAL ENTERTAINS IDEA OF MUNICIPAL HYDRO PLANT.—The water board of Springfield, Mass., soon will be ready to recommend a plan for financing the construction of a municipal hydro-electric plant at the new Cobble Mountain reservoir, according to Chairman Edwin A. Blodgett. Such a plant, it is estimated, would cost $8,000,000. Market opportunities for energy thus provided and other factors of the question are receiving careful study, he said. The reservoir will impound 23,000,000,000 gal. of water.

NOW COMES THE "LONGEST" ELECTRIC SIGN.—What is said to be the longest illuminated sign in the world has recently been completed at South Bend, Ind., for the Bendix Brake Company. Instead of the usual outlining of the letters in electric bulbs, the designers used indirect floodlighting. The letters are of cut steel, white enameled, and mounted on a background of iron mesh. Two 100-watt lamps, with high efficiency reflectors, light each letter. The sign is a sixth of a mile long and is visible from all passing trains as well as the Lincoln and Chicago Highways.

A.E.S.C. CALLS CONFERENCE ON SPEEDS OF DRIVEN MACHINES.—At the request of the National Electrical Manufacturers' Association, the American Engineering Standards Committee has called a general conference to be held in the rooms of the American Society of Civil Engineers, Engineering Societies Building, New York, on Friday, Dec. 9, at 10 a.m., to determine whether a national system of standard speeds for driven machinery shall be set up. Organizations concerned with this matter are invited to communicate with P. G. Agnew, secretary of the A.E.S.C., at 29 West Thirty-ninth Street, New York.

EIGHT HUNDRED MEN INSPECT BINGHAMTON'S ENLARGED PLANT.—Business men, bankers, members of service clubs and chambers of commerce and city, town and county officials, approximately 800 in number, representing more than 100 communities served by the Binghamton Light, Heat & Power Company, took part in an inspection tour at the company's main power station at Johnson City, N. Y., recently. The inspection was incident to the placing in service of the new 35,000-kw. turbo-generator and the energizing of the newly completed 110,000-volt transmission line from the power station to Elmira, linking the Binghamton company with the Elmira Water, Light & Railroad Company. After lunch had been served in a steam-heated tent the inspection tour started at the coal pile and led through the boiler room, in which three high-pressure boilers burning pulverized fuel have just been installed, into the turbine room, where a machine

## *Coming Meetings*

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see the ELECTRICAL WORLD for July 2, page 50.]

National Electrical Manufacturers' Association — Radio Division, Edgewater Beach Hotel, Chicago, Nov. 28-Dec. 1; Supply Division, Hotel Commodore, New York, Jan. 23-30. S. N. Clarkson, 420 Lexington Ave., New York.

American Physical Society—Chicago, Nov. 25-26; Nashville, Dec. 28-30. H. W. Webb, Columbia University, New York.

American Institute of Electrical Engineers — Regional meeting Great Lakes District, Drake Hotel, Chicago, Nov. 28-30; winter convention, New York, Feb. 13-16. F. L. Hutchinson, 33 West 39th St., New York.

National Association of Utility Secretaries—Oklahoma City, Dec. 5-7. E. F. McKay, 307 Local Bldg., Oklahoma City.

American Society of Mechanical Engineers—New York, Dec. 5-8. C. W. Rice, 29 West 39th St., New York.

National Electrical Credit Association —New York Division, Dec. 13. W. J. Kreger, 261 Broadway, New York.

New England Central Station Association of Power Engineers—Chamber of Commerce, Boston, Dec. 15. T. D. Bond, Room 941, 200 Devonshire St., Boston.

American Engineering Council—Washington, D. C., Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington.

Northwest Association of Electrical Inspectors—Olympic Hotel, Seattle, Jan. 26-28. F. D. Weber, 414 Lumbermen's Building, Portland, Ore.

for testing insulators was used in an electrical demonstration employing 500,000 volts. Seventy-five guides explained operating methods and the labeling of all the equipment helped the visitors to grasp the progressive functions served.

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TWO MORE TEXAS ITEMS.—Construction of another unit for the power plant of the West Texas Utilities Company at San Angelo will be started immediately, according to George W. Fry, president. The capacity of the plant will thereby be increased from 7,500 hp. to 16,000 hp., at an expenditure of $500,000. When the additional unit is completed the plant will be the company's largest.——Electric lights and power will soon be available to the people of Rio Grande City, including the historic military post of Fort Ringgold. The Valley Electric Company, subsidiary of the Central Power & Light Company, is extending its transmission line from Mission, about 38 miles distant.

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HIGHWAY ACROSS CONOWINGO DAM OPENED TO PUBLIC.—With a brief ceremony participated in by officials of the Philadelphia Electric Company, Stone & Webster and the Arundel Corporation of Baltimore, all concerned with the building of the great hydro-electric plant at Conowingo, Md., a pike highway over the top of the 80-per-cent-complete dam was opened to the public on Nov. 16. This road takes the place of a wooden bridge over the Susquehanna River, a mile distant, which will be destroyed. The new asphalt roadway is 22 ft. wide and three-quarters of a mile long. It shortens the route from Philadelphia to Baltimore by four miles.

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VERMONT HYDRO-ELECTRIC CORPORATION SUED BECAUSE OF DAMAGE FROM BREAKING OF DAM.—The Vermont Hydro-Electric Corporation has been made defendant in the Rutland County Court in a suit for $40,000 instigated by the Manning Manufacturing Company, Rutland, Vt. The plaintiff, which has a foundry, sawmill and power plant, alleges that the breaking of the power company's Glen dam at Mendon during the recent flood caused extensive losses to the Manning company. The petition alleges that the dam was carelessly constructed and that it was the continued duty of the power company to guard and repair it. The dam safeguarded about 42,000,000 gal. of water, which was let loose.

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CAPE BRETON, N. S., WANTS CHEAPER ENERGY.—A movement is on foot to get cheaper electric power for Cape Breton Island, Nova Scotia. A temporary Power Board Committee, consisting of the mayors of all the incorporated centers and the wardens of the counties, has been appointed to gather data. The meeting at which the committee was selected was called primarily to consider a scheme to develop hydro-electric power at Lake Ainslie, where fairly complete data are said to indicate that power can be developed at about a cent and a quarter per kilowatt-hour to the extent of 15,000,000 kw.-hr. Present consumption is about 9,000,000 kw.-hr., and the rate in Sydney, the chief city, is 12 cents. The committee is charged particularly to get all available information on steam-electric power at the mine mouth.

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ACTIVITIES OF NEBRASKA COMPANIES.—The Northern Nebraska Power Company, which has a hydro-electric development on the Niobrara River, near Spencer, has been unable to supply all the requirements of a wholesale contract entered into with the Interstate Power Company and will therefore add two feet to its 23-ft. dam.——The Nebraska Light & Power Company has made an appropriation of $100,000 for improvements to its system centering at McCook. Half of this is to be expended immediately on the construction of a high-tension line from Gothenburg to Eustis.——The Interstate Power Company is carrying out an extensive program in northern Nebraska. It is rebuilding its line between Creighton and Hartington to avoid rebuilding the Hartington plant of its subsidiary, the Cedar Power & Light Company; at Valentine, where it owns a hydro-electric plant, it is installing an additional 300-hp. generator, and it is building a line from Neligh to Petersburg which will be the last link in a connection with the hydro-electric plant at Spencer and with Sioux Falls, S. D.

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WHO'S WHO ELECTRICALLY IN CHICAGO.—The Electric Club, which is a parallel organization of the Electric Association of Chicago, has in preparation a book of concise biographical sketches of all members. It is expected that the placing of this volume in the hands of members will broaden acquaintance and greatly improve that personal relationship between members which the club promotes.

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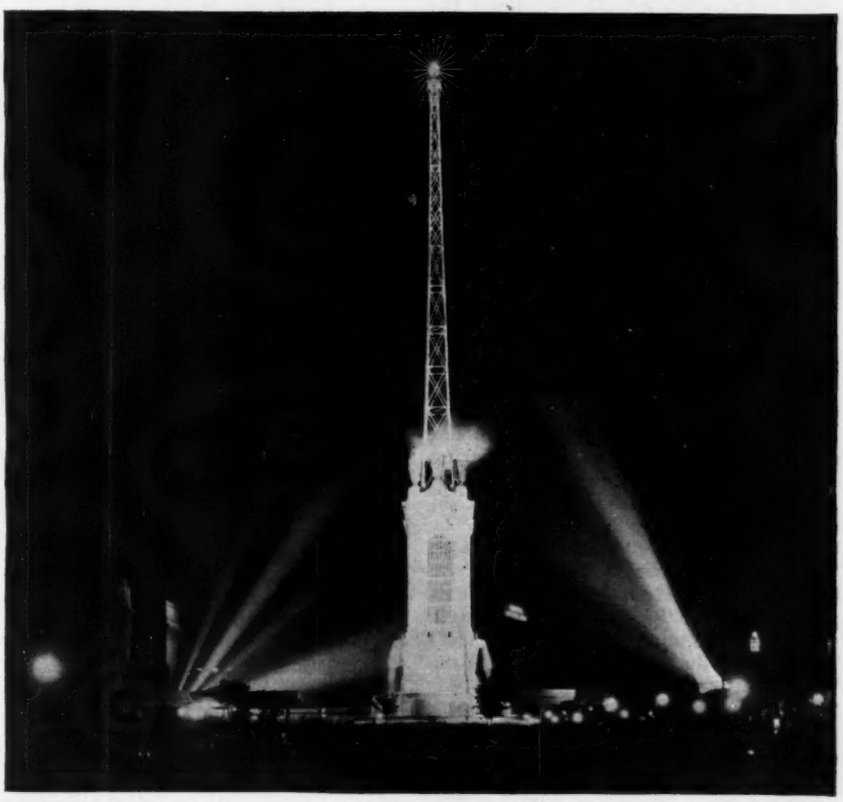
ROOSTING BUZZARDS PREFER POLES TO TREES.—Several times recently the trouble crews of the Carolina Power & Light Company have traced power interruptions to buzzards roosting on the line. Particularly was this true near Roxboro, N. C., where interruptions to industry have caused considerable annoyance and loss of time. It was discovered that buzzards had forsaken

## Cleveland's "Musical Tower of Jewels"



MUCH attention was attracted at the industrial exposition recently held at Cleveland by the "musical tower of jewels" which rose from a varicolored cascade of falling water to a height of 220 ft., displaying a "sunburst of gems" which was illuminated by rays from 36 18-in. searchlamps rated at 8,000,000 cp. Within this ornamental cascade, entirely concealed behind panels of fine netting, were six "super-panatropes," an auditorium loud speaker recently perfected in the research laboratories of the General Electric Company, which in tests at Schenectady has been heard for more than half a mile with such volume as to be enjoyed. The spectacle was the work of J. W. Gosling, decorative designer of the General Electric illuminating laboratories.

their tree roosts and were spending the nights on power poles. When dawn came the birds began to stretch, much as some human beings do, and occasionally a pair of wings stretched too far and touched the wires along the cross-arms, putting an end to the buzzard but causing a short circuit and consequent interruption of service.

WORK ON SACANDAGA DAM IN NEW YORK STATE TO BEGIN THIS YEAR.—Construction work on the nine-million-dollar Sacandaga Dam in upper New York State, completion of which will be followed by power developments by private concerns, will commence before the end of the present year, according to an official announcement made by the Hudson River Regulating District Board at Albany. The contracts will call for the completion of the project by Nov. 30, 1929. The flow of the river will be regulated by a control gate which will create an artificial lake 22 miles long and will impound 37,000,000,000 gal. of water, it is estimated. The dam will be 1,000 ft. long, 95 ft. high and 600 ft. wide at the base.

POWER PAPERS FOR ANNUAL MEETING OF A.S.M.E.—For the regular annual meeting of the American Society of Mechanical Engineers, called for New York, Dec. 5-8, these papers relating to central-station power have been listed: "Some Factors in Furnace Design for High Capacity," by E. G. Batley, and "Some Operating Data of Large Steam Generating Units," by Henry Kresinger and T. E. Purcell. They will be presented on Thursday morning, Dec. 8. In the afternoon of that day there will be a session on oil and gas power. On Tuesday afternoon W. E. Wickenden will speak on "What the National Engineering Societies Can Do for Engineering Education."

CONFERENCE ON INDUSTRIAL ELECTRICAL HEAT TREATMENT.—A conference on industrial electrical heat treatment will be held at the Dunham Laboratory, Yale University, under direction of the electrical engineering department, in co-operation with the Manufacturers' Association of Connecticut, on Wednesday, Nov. 30. The morning session will include papers on "Industrial Electrical Heat," by Prof. C. F. Scott; "How Electricity Heats and Its Control," by Prof. W. B. Hall, and "From Guess to Science in Heat Treatment," by Prof. C. H. Mathewson. In the afternoon the papers will be: "Electric Furnaces for Heat Treating," by Wirt S. Scott, Westinghouse Electric & Manufacturing Company; "How Electric Heat Treatment Affects Production Costs," by C. L. Ipsen, General Electric Company, and "Labor Savings Resulting from Continuous Automatic Electric Furnaces," by R. E. Talley, George J. Hagan Company, Pittsburgh. In the evening "Hardening of Small Tools" will be discussed by A. H. d'Arcambal, Pratt & Whitney Company, Hartford, and a motion picture covering industrial electrical heating will be presented.

# Recent Court Decisions

UNFULFILLED PROMISE BY OPERATOR OF DERRICK TO NOTIFY COMPANY IF IT WAS MOVED NEAR DEFECTIVE WIRES DOES NOT SHIFT BLAME.—Mrs. R. H. Jones sued the Rome Railway & Light Company for damages because her husband was killed through the contact with a defectively insulated transmission wire belonging to the company of a steel derrick with which he was working. It was shown that the derrick was at first at a safe distance from the company's wire, but was subsequently brought nearer, and the Court of Appeals of Georgia sustained a verdict holding the company responsible. The defendant, the court held, might reasonably have anticipated that the derrick would be moved from time to time and might be brought near enough to make contact with its lines, and the fact that the person in charge of its operation promised to notify the company if that was done and did not do so, could not absolve the company from the charge of negligence. (139 S. E. 579.)*

PUBLIC SERVICE COMMISSION RULE REGARDING RESPONSIBILITY FOR CONDITION OF EQUIPMENT IS OVERTHROWN.—In Compton vs. Alabama Power Company the plaintiff sought damages because of a fire in his home alleged to have been due to defective service wires installed by the defendant. The suit was for breach of duty, and the trial court found for the defendant, basing its decision in part on a rule of the Alabama Public Service Commission providing that a company in accepting a customer's application and installing service does not assume obligation as to the condition of the customer's equipment and that no representation of a company employee shall bind the company unless it is in writing and approved by an official. In reversing judgment and ordering a new trial the Supreme Court of Alabama denied any validity to this rule, holding that it dealt with matters of liability and prescribed rules of substantive law outside the purview of the commission. Other commission rules admitted in evidence were conceded to be valid, but their pertinency was denied. (114 So. 46.)

HEARSAY EVIDENCE OF NEGLIGENCE HELD VALID WHEN ADMITTED WITHOUT OBJECTION.—In an action brought by one Young against the Vallejo (Cal.) Electric Light & Power Company for the destruction of plaintiff's house through the alleged fault of the company, hearsay evidence by a witness for the plaintiff that the latter several months before the fire said he had notified the company to remove wires resting upon the roof of a house he had just built was held sufficient by the District Court of Appeals to prove that the defendant had at such time received notice of the position of the wires, although to admit this evidence over objection, had there been any, would have been an error. A motion for nonsuit was properly denied, the reviewing court said, defendant being held grossly negligent in transmitting electricity through the wires in question for five or six months after notification of the danger. The question of the plaintiff's contributory negligence in so building the house that the wires would rest on its roof and in attempting to safeguard it by putting a piece of rubber hose around the wires was for the jury to decide. (259 Pac. 973.)

JURY MUST DECIDE FACTS ON ISSUE OF NEGLIGENCE.—A workman (Ballard) engaged in splicing cables for the Kansas City Power & Light Company was injured when an automobile upset a kettle containing a hot compound used in the work, the contents flowing down a manhole and scalding him. He sued the company for damages, maintaining that negligence had been shown by it in placing the kettle where it was and that the accident might reasonably have been foreseen. The Kansas City Court of Appeals affirmed a verdict for the plaintiff on the ground that the question of negligence had properly been left to the jury and that the company could not claim exemption on the ground that its negligence would not have caused injury had it not been combined with the negligence of a third party, the driver of the automobile. (298 S.W. 131.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

FINANCIAL AGREEMENT BETWEEN AFFILIATED COMPANIES MUST BE JUSTIFIED BEFORE CHARGES TO CAPITAL ACCOUNT ARE APPROVED.—The Wisconsin Railroad Commission complained of the practice of the Wisconsin Fuel & Light Company in charging to its fixed-capital accounts amounts equal to 10 per cent of the direct charges to those accounts to represent the services of the Interstate Fuel & Light Company or the Utilities Operating Company rendered in connection with construction work. The records did not disclose any information relative to the amount or nature of the services rendered by these companies, and consequently there was nothing to substantiate the reasonableness of the charges made. The commission felt therefore that it would not be proper to approve of the charges, maintaining that the mere existence of an agreement between affiliated companies does not alone justify such charges to capital account but it must be shown that the utility company is receiving services which it actually requires at a fair price based on the costs incurred.

OREGON COMMISSION INTERPRETS STATUS OF INTERSTATE REGULATION.—According to the Oregon Public Service Commission, the ultimate consumer of electric light and power still retains all the usual protective privileges which have been afforded him by the regulatory laws of the state, irrespective of statutory provisions recently interpreted to the effect that state commissions are without jurisdiction in matters involving the interstate sale of energy for resale and distribution. In disclaiming the right to regulate the rates and practices in connection with the sale of power by the Idaho Power Company to the Vale Electric Company for redistribution in Oregon territory, the Oregon commission discarded no authority as to the regulation of operations which immediately or directly affect the interests of the customers of the Vale utility. Operations confined to this phase of interstate service, the commission announces, are wholly within its jurisdiction, but transactions taking place between the Idaho Power Company and the Vale Electric are matters for other agencies to regulate if necessary.

# News About Men of the Industry

J. LYMAN GOLLEGLY, publicity manager of the Utica Gas & Electric Company, has been appointed director of advertising for the New York Power & Light Corporation, Albany. Mr. Gollegly will assume his new duties Dec. 1.

JAMES J. FLYNN of Rush City, Minn., has been elected president of the Eastern Minnesota Power Company to succeed the late J. M. Allen of Pine City. Mr. Flynn is vice-president of the State Bank of Rush City.

DR. W. D. COOLIDGE, assistant director of the research laboratory of the General Electric Company, has been awarded the Hughes medal by the Royal Society of Great Britain for "distinguished work on X-rays and the development of highly efficient apparatus for their production."

FRANK D. COMERFORD, general counsel of the New England Power Association, has been elected president of that association to succeed Henry I. Harriman, who becomes vice-chairman of the board of directors. Mr. Comerford is a member of the Boston law firm of Ropes, Gray, Boyken & Perkins and one of the leading public utility lawyers of New England. He has been general counsel for more than a year.

W. D. LIVINGSTON has been appointed assistant to R. B. Keating, vice-president of the West Penn Electric Company, Pittsburgh. Mr. Livingston was formerly connected for two years with the American Water Works & Electric Company, serving for fifteen months in the engineering department and for a year in the department of management and operation. He is a native of Lexington, Ky.

WARREN H. MCBRYDE has severed his connection with the California Hawaiian Sugar Refining Corporation, with which he had been connected for the past eight years, to open offices in San Francisco as a consulting engineer. As electrical and mechanical engineer, Mr. McBryde was connected with the Yuba Electric Company, the Bay Counties Power Company and the California Gas & Electric Company, all predecessors of the Pacific Gas & Electric Company. Last year he was chairman of the San Francisco section of the American Institute of Electrical Engineers, and he has served as a director of the Engineers' Club for several years.

PERCY H. CRAVEN, district representative of the Utah Power & Light Company at Eureka in the Provo division, has been appointed manager of the company's Idaho Falls division to succeed Leslie W. Nims, who has assumed new duties at Provo. EDWARD HEIM, who for some time has been an assistant engineer in the office of the chief engineer, will have charge of the Eureka district. Mr. Craven has represented the Utah Power & Light Company at Eureka during the past ten years. A native of Lewisburg, Pa., and a graduate of Bucknell University, Mr. Heim has spent his entire business career in the territory of the Utah Power & Light Company.

## Harold L. Geisse with Byllesby Interests

Harold L. Geisse, secretary and general manager of the Wisconsin Valley Electric Company, Wausau, Wis., has been appointed manager of the Wisconsin division of the Northern States Power Company, with offices in Eau Claire. Mr. Geisse has been active in utility affairs in Wisconsin for some time. He served as statistician with the Railroad Commission of Wisconsin for one year, subsequently becoming assistant secretary and finally secretary. He was identified with the Northwest Utilities Company, an Insull property, and with the Janesville Electric Company before taking charge of the Wisconsin Valley Electric Company in 1921. Mr. Geisse is a past-president of the Wisconsin Utilities Association.

H. L. GEISSE

# Obituary

NORMAN S. LAWRENCE, vice-president and director of sales of the Whiting Corporation, Harvey, Ill., died Oct. 26 after a brief attack of pneumonia. Following graduation from Cornell University he entered the employ of the Whiting Corporation as an estimator, becoming successively chief estimator, assistant sales manager, vice-president and director of sales. During the past few years he was also president of the Swenson Evaporator Company, a subsidiary of the Whiting Corporation. Mr. Lawrence had a wide acquaintance in the iron and steel manufacturing field and played an active part in various business organizations, such as the American Foundrymen's Association, Foundry Equipment Manufacturers' Association, Electric Overhead Crane Institute and others.

CHARLES D. STANFORD, financier and promoter of power projects in Maine, died recently at his home in Bangor, Me. Mr. Stanford was 81 years of age. He had been connected with various power developments in eastern Maine up to the present operations of the Bangor Hydro-Electric Company. He was also one of the founders of the Bangor Street Railway Company and was connected with other commercial enterprises.

REUBEN B. SLEIGHT, assistant to Herbert Hoover, Secretary of Commerce, was killed Nov. 14 at Montpelier, Vt., as the result of an airplane crash. Mr. Sleight was formerly engineer with the Minnesota Tax Commission in charge of appraising transmission lines in that state. He also established the system of appraising power plants which is now used by the commission. He served in that capacity from 1922 until he accepted his governmental position under Secretary Hoover. Mr. Sleight was 36 years of age.

EDWARD H. WELLS, chairman of the board of directors of the Babcock & Wilcox Company, New York, died at his home in Montclair, N. J., Nov. 17 at the age of 68. Though a native of Dorrville, R. I., Mr. Wells spent his early life in Pittsburgh. He affiliated himself with the Babcock & Wilcox Company as engineer in charge of sales in 1892, six years later becoming president and eight years ago chairman. In addition to his executive duties as chairman he served on the directorate and as chairman of the executive committee of the Worthington Pump & Machinery Corporation and as a director of the North American Company.

CHARLES R. HOSMER, Canadian financier, died at Montreal Nov. 14 in his seventy-seventh year. Mr. Hosmer had been identified with a number of industrial and public utility enterprises during his business career. He was president of the West Kootenay Power & Light Company, Ltd., vice-president of the Kaministiquia Power Company, Ltd., and the Laurentide Company, Ltd., and a director of the Montreal Light, Heat & Power Consolidated. Mr. Hosmer was a director of the Consolidated Mining & Smelting Company of Canada, which was largely built up by his efforts in uniting a number of the mining interests embraced in that organization. Notwithstanding the absorbing nature of his business activities, he gave much attention to philanthropic work and held official positions in several benevolent organizations.

# Financial and Statistical News

### *Common Stocks Up Leaders Are Active Profit-Taking in Bonds*

SUBSTANTIAL advances made by such power and light common stocks as Brooklyn Edison, Columbia Gas & Electric, Detroit Edison and Middle West Utilities have brought averages up several points. The ELECTRICAL WORLD index of fifteen representative common stocks has reached the highest point on record at 117, against 113 a month ago and 94 a year ago. The feature of the week is a rise of eleven points in Brooklyn Edison. Apart from the stocks of these and other larger companies, however, many of the smaller issues have failed to recover entirely from the recent selling movement and are slightly below their high for the year.

This seems to indicate that stockholders have little apprehension concerning possible consequences of federal investigation. Stocks of companies whose operations are most likely to come under inspection are, generally speaking, showing the greatest strength.

Preferred issues have moved along listlessly without any marked price changes. In the bond market there has been some profit taking after a week of unusual strength, but averages remain practically unchanged.

## Oregon Utilities Pay 15 Per Cent of Property Tax

Fifteen per cent of all the property tax to be paid in Oregon during the current year will be borne by the public utilities, according to the figures of the State Tax Commissioner. This amount will aggregate $6,500,000, or an increase in the past four years of approximately $2,000,000. Ten per cent of every dollar paid for light, power and water service in that state goes for property tax, the commissioner states.

Referring to a present agitation for the adoption of a gross earnings tax system in Oregon, by which public utilities' earnings would be taxed and the money used for the conduct of the government, Commissioner Fisher advises strongly against such a change. He says that a gross earnings tax would operate only to sacrifice revenues from utilities and result in no savings to the respective counties. Under the gross earnings plan, Mr. Fisher holds, no assurance is given that rates will remain the same, and a revision of rates by legislative action would be necessary within a few years at best. In this latter event, he predicts, the matter of utility taxation would be brought before the public as a political issue. The ad valorum method of taxing property is the only just and adequate one in so far as the State of Oregon is concerned, Commissioner Fisher believes.

## September Operations Show Upward Trend

### Revenue Rises to $145,300,000—Increases 9.6 Per Cent Over 1926—Electrical Energy Generated Averages 207,000,000 Kw.-Hr. Daily

WITH an increase of 9.6 per cent compared with the corresponding month of 1926, bringing the September revenue up to $145,300,000, the electric light and power industry entered on its usual autumnal upward swing. The rate of change was nearly 1 per cent greater than in midsummer and resulted for the first time in ten months in a revenue virtually equal to the estimated normal based on the preceding five years' operations. Thus far during the year it had been slightly below the standard established by the recent prosperous half decade, though always above 1926 by a margin ranging from 8.7 per cent up. The average daily revenue was $4,840,000. The month's operating expenses are estimated at $63,700,000, or 6.1 per cent greater than in September, 1926.

In energy output the usual rise from August is also in evidence. The total, 6,222,000,000 kw.-hr., is about 3 per cent above the estimated normal, though the increase from the corresponding month of 1926 was less than usual, being only 6.8 per cent. Water power furnished about 35 per cent of the whole output; the quantity was 7.8 per cent greater than in the previous September, but it was below the hydro output for August. Fuel consumption included 3,183,450 tons of coal, 482,363 barrels of oil and 6,466,951,000 cu.ft. of natural gas. Oil consumption only slightly exceeded the very low figure reached in July.

To the energy generated in the United States there should be added imports from Canada, probably around 130,000,000 kw.-hr. Data are not yet available. The energy purchased for resale, estimated at 1,289,000,000 kw.-hr., was almost exactly the same as in August and exceeded the previous September figures by less than 7 per cent. The smallness of the increase is noteworthy. It indicates that the industry reached a

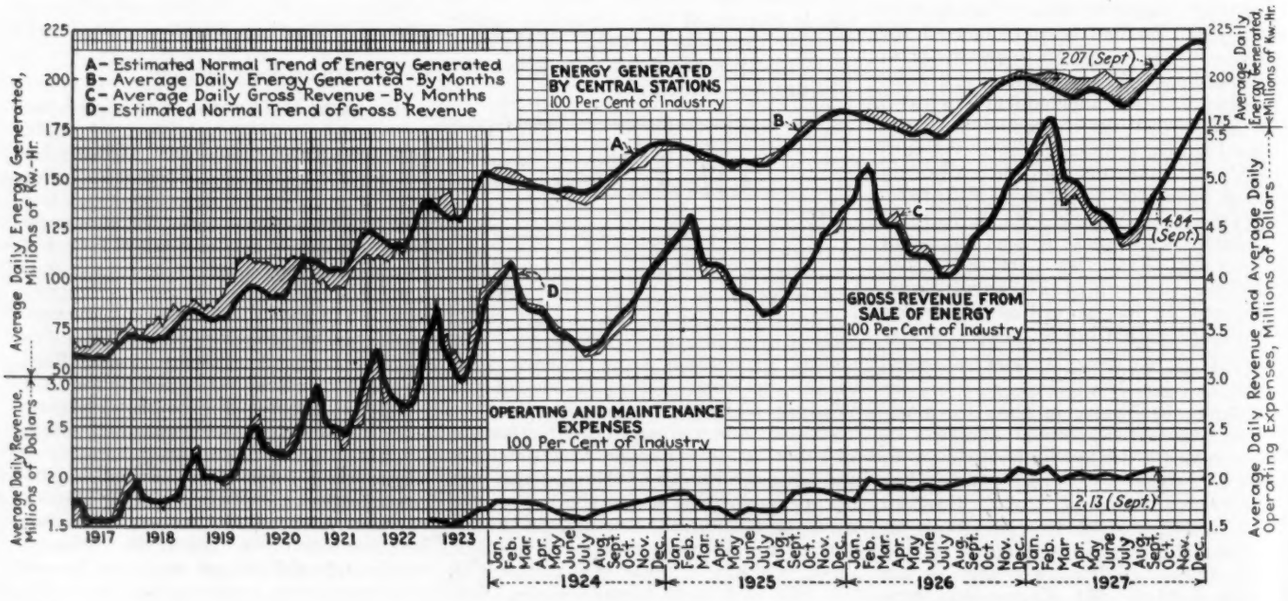

A- Estimated Normal Trend of Energy Generated
B- Average Daily Energy Generated - By Months
C- Average Daily Gross Revenue - By Months
D- Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
207 (Sept.)
4.84 (Sept.)
2.13 (Sept.)
Average Daily Energy Generated, Millions of Kw.-Hr.
Average Daily Revenue, Millions of Dollars
Average Daily Revenue and Average Daily Operating Expenses, Millions of Dollars
Average Daily Energy Generated, Millions of Kw.-Hr.
1917 1918 1919 1920 1921 1922 1923
1924 1925 1926 1927

TABLE I—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES
(100 Per Cent of the Industry)

| Month | Kw.-Hr. Generated Monthly * | | | Estimated Distribution of Energy Generated | | | | | | | | | | Energy Purchased by Public Utilities for Resale, Kw.-Hr. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Energy Consumption by Central-Station Customers, Kw.-Hr. | | Energy Consumed for Lighting, Kw.-Hr. | | Energy Consumed for Power, Kw.-Hr. | | Energy Sold to Electric Railways, Kw.-Hr. | | Energy Used in Intracompany Business, Including Line Losses, Kw.-Hr. | | | |
| | 1927 Thousands | 1926 Thousands | Per Cent Inc. | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands |
| June | 6,127,247 | 5,509,356 | +11.2 | 5,043,247 | 4,446,356 | 1,205,000 | 1,150,000 | 3,310,247 | 2,774,356 | 528,000 | 522,000 | 1,084,000 | 1,063,000 | 1,228,000 | 1,050,000 |
| July | 6,109,472 | 5,562,172 | + 9.8 | 5,028,472 | 4,489,172 | 1,242,000 | 1,164,000 | 3,262,472 | 2,808,172 | 524,000 | 517,000 | 1,081,000 | 1,073,000 | 1,178,000 | 1,010,000 |
| Aug | 6,312,191 | 5,777,753 | + 9.2 | 5,196,191 | 4,663,753 | 1,265,000 | 1,212,000 | 3,404,191 | 2,932,753 | 527,000 | 519,000 | 1,116,000 | 1,114,000 | 1,291,000 | 1,122,000 |
| Sept | 6,222,002 | 5,825,852 | + 6.8 | 5,121,002 | 4,701,852 | 1,274,000 | 1,188,000 | 3,336,002 | 3,009,852 | 511,000 | 504,000 | 1,101,000 | 1,124,000 | 1,289,000 | 1,210,000 |

*Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only

new high level of energy interchange about a year ago; no important growth has since occurred. What increases may have taken place were substantially balanced by consolidations whereby transfers of energy were converted from intercompany to intracompany transactions and so disappeared from the record of sales and purchases.

Regionally the growth of operations differed materially from the general average. Nationally the September revenue of companies thus far reporting was about 6.9 per cent greater than that of August. In 1926 it was 6.4 per cent. The greatest gain this year was in the Atlantic States, the reports showing a 9.5 per cent increase as against 8.7 last year. The Western group, with a different seasonal trend, rose to 2 per cent from 1 per cent. But the North Central group dropped slightly to 6.3 from 6.5 per cent, the South Central similarly to 5.9 from 6.3 and the New England companies to 6.5 from 9.2 per cent.

TABLE II—OPERATING RATIO OF CENTRAL-STATION COMPANIES

| Month | Operating Ratio | | | | | |
|---|---|---|---|---|---|---|
| | Steam Plants | | Hydro Plants | | Combined Hydro and Steam Plants | |
| | 1927 | 1926 | 1927 | 1926 | 1927 | 1926 |
| June | 48.9 | 49.9 | 35.3 | 32.1 | 42.5 | 45.0 |
| July | 51.3 | 52.3 | 34.2 | 33.4 | 44.3 | 46.4 |
| Aug | 52.8 | 53.6 | 34.6 | 36.3 | 44.1 | 45.8 |
| Sept | 48.8 | 49.7 | 33.4 | 37.5 | 42.1 | 43.3 |

## New Issues Reach Total of $72,500,000

Six electric light and power companies during the week ended Nov. 23 offered new issues to the investing public to the amount of $72,516,000. First and refunding mortgage 4½ per cent gold bonds of the Ohio Power Company were issued at 94¾ and accrued interest, to yield 4.84 per cent, a piece of financing involving a total of $9,702,000. Proceeds from the sale of these series D bonds will provide part of the funds required for the retirement of first and refunding mortgage 7 per cent gold bonds, series A, now outstanding.

On Wednesday several substantial loans were floated. The Public Service Electric & Gas Company issued first and refunding mortgage gold bonds to the amount of $45,000,000 at 98 and interest to yield over 4.60 per cent. Proceeds will be used to retire outstanding bonds and for expeditures already made for additions and improvements to properties.

The Mississippi Power & Light Company made an offering of first mortgage gold bonds, amounting to $9,000,000, the price being 97¼ and accured interest.

First and refunding mortgage gold bonds of the Illinois Power & Light Corporation were offered at 98 and interest, to yield over 5.13 per cent, a piece of financing involving a total of $5,000,000. These series C bonds were dated Dec. 1, 1926, and mature Dec. 1, 1956.

The Wisconsin Hydro-Electric Company made an offering of first mortgage 5 per cent gold bonds, series of 1947, totaling $2,000,000, the price being 95½ and interest, to yield about 5.37 per cent.

First mortgage 6 per cent gold bonds, series B, of the Florida Public Service Company, amounting to $1,814,000, were offered during the week under review. These bonds, dated April 1, 1925, and maturing April 1, 1955, were priced at 101 and accrued interest, to yield over 5.90 per cent.

TABLE III—CENTRAL-STATION FINANCIAL OPERATIONS FOR FOUR MONTHS IN THE UNITED STATES
(100 Per Cent of the Industry)

| Month | Total Gross Revenue from Sale of Energy† | | | Estimated Distribution of Gross Revenue | | | | | | | | Total Operating and Maintenance Expenses‡ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lighting Customers | | Power Customers | | Electric Railways | | Other Public Utilities | | | |
| | 1927 Thousands | 1926 Thousands | Per Cent Inc. | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands | 1927 Thousands | 1926 Thousands |
| June | $138,700 | $125,500 | +10.6 | $81,500 | $77,200 | $42,000 | $35,000 | $4,700 | $4,600 | $10,500 | $8,700 | $62,600 | $58,400 |
| July | 134,300 | 123,600 | + 8.7 | 77,700 | 74,700 | 41,900 | 35,500 | 4,500 | 4,500 | 10,200 | 8,900 | 62,400 | 59,100 |
| August | 135,600 | 124,600 | + 8.8 | 79,900 | 76,800 | 41,400 | 35,200 | 4,400 | 4,300 | 9,900 | 8,300 | 63,000 | 59,700 |
| Sept | 145,300 | 132,600 | + 9.6 | 84,700 | 80,500 | 44,700 | 38,000 | 4,600 | 4,500 | 11,300 | 9,600 | 63,700 | 60,300 |

†Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡Do not include interest, taxes, depreciation or sinking fund.

TABLE IV—OPERATIONS OF CENTRAL-STATION HYDRO AND FUEL PLANTS IN THE UNITED STATES*
(100 Per Cent of the Industry)

| Month | Energy Generated | | | | | | Fuel Consumption | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydro-Plants | | | Fuel Power Plants | | | Coal | | | Oil | | | Gas | | |
| | 1927 Thousands of Kw.-Hr. | 1926 Thousands of Kw.-Hr. | Per Cent Increase | 1927 Thousands of Kw.-Hr. | 1926 Thousands of Kw.-Hr. | Per Cent Increase | 1927 Short Tons | 1926 Short Tons | Per Cent Increase | 1927 Barrels | 1926 Barrels | Per Cent Increase | 1927 Thousands of Cubic Feet | 1926 Thousands of Cubic Feet | Per Cent Increase |
| June | 2,491,840 | 2,191,225 | +13.7 | 3,635,407 | 3,318,131 | +9.6 | 2,904,907 | 2,807,988 | +3.4 | 453,025 | 589,567 | —23.1 | 5,214,762 | 4,190,576 | +24.4 |
| July | 2,401,852 | 1,971,199 | +21.8 | 3,707,620 | 3,590,973 | +3.2 | 2,996,291 | 2,993,960 | + .07 | 449,903 | 671,984 | —33.1 | 5,598,713 | 5,056,094 | +10.7 |
| August | 2,378,924 | 2,062,629 | +15.2 | 3,933,267 | 3,715,124 | +5.9 | 3,154,914 | 3,060,647 | +3.0 | 480,073 | 728,864 | —34.1 | 6,259,125 | 5,403,316 | +15.8 |
| September | 2,191,325 | 2,033,312 | + 7.8 | 4,030,677 | 3,792,540 | +6.3 | 3,183,450 | 3,114,535 | +2.2 | 482,363 | 883,913 | —45.5 | 6,466,951 | 4,816,955 | +34.3 |

*As collected by United States Geological Survey. The data are for the electric light and power industry only.

## New York Power & Light Directorate Named

Directors of the New York Power & Light Corporation, recently formed by the consolidation of the Municipal Gas Company of Albany, the Adirondack Power & Light Corporation, the Cohoes Power & Light Corporation, the Troy Gas Company and the Fulton County Gas & Electric Company, are representative of the industrial and public utility interests of the territory served by the company. They are Charles S. Brewer, Charles S. Ruffner, Neile F. Towner, who has practiced law in Albany since 1898; Robert Olcott, president of the Mechanics and Farmers' Bank of Albany; Jesse R. Lovejoy, a vice-president and director of the General Electric Company; Darius E. Peck, assistant manager of the law department of the General Electric Company; Maurice Hoopes, president of Finch-Pruyn Company, Inc., of Glens Falls; Abram V. Morris, one of the leading textile manufacturers of Amsterdam; Henry C. Shields, president of the Troy Gas Company; Thaddeus R. Beal, president of the Central Hudson Gas & Electric Corporation, Poughkeepsie, and O. L. Johnston, who is connected with Simpson, Thacher & Bartlett, attorneys of New York City.

The board elected as executive vice-president of the new company Otto Snyder, formerly vice-president and general manager of the Adirondack Power & Light Corporation. Other vice-presidents named were Henry C. Shields, John L. Haley, C. A. Davis and L. C. Smith. Mr. Shields has been president of the Troy Gas Company; Mr. Haley has been vice-president of the Adirondack Power & Light Corporation, Troy Gas Company and Municipal Gas Company; Mr. Davis has been president of the Cohoes Power & Light Corporation, and Mr. Smith has been president of the Fulton County Gas & Electric Company. J. M. Seay, general auditor of Mohawk-Hudson Power Corporation, was elected vice-president and comptroller of the new company; M. E. Skinner, commercial manager of Mohawk-Hudson, was elected vice-president and commercial manager, and L. A. Jones, Mohawk-Hudson purchasing agent, was elected vice-president and purchasing agent. Paul D. Weathers, treasurer of Mohawk-Hudson Power Corporation, was elected treasurer of New York Power & Light Corporation, and J. F. McKinney, formerly secretary and general counsel of Adirondack Power & Light Corporation, was elected secretary.

## Company Reports

| Name of Company | Gross Earnings Twelve Months Ended Oct. 31 1927 | 1926 |
|---|---|---|
| American Water Wks. & El. and subs.* | $48,255,709 | $44,283,033 |
| Carolina Power & Light* | 8,778,897 | 7,936,199 |
| Central Illinois Light | 4,368,053 | 4,136,421 |
| Cities Service | 32,344,438 | 23,748,384 |
| Columbia Gas & Electric and subs.* | 96,746,522 | 91,464,131 |
| Commonwealth Power and subs. | 52,648,976 | 48,523,349 |
| Consumers Power | 26,278,782 | 23,619,645 |
| Detroit Edison | 38,532,371 | 36,397,293 |
| Illinois Power | 2,631,321 | 2,579,030 |
| Kansas City Pwr. & Light | 12,125,478 | 10,753,746 |
| Middle West Utilities and subs.* | 92,983,517 | 81,391,307 |
| Milwaukee El. Ry. & Lt.* | 26,913,445 | 25,887,850 |
| Ohio Edison | 1,907,500 | 1,784,483 |
| Public Service Co. of New Hampshire and subs.* | 3,641,433 | 3,548,193 |
| Southern California Edison | 25,366,933 | 22,645,946 |
| Southern Indiana Gas & El. | 3,030,768 | 2,845,981 |
| Tennessee Electric Power | 12,437,744 | 11,940,956 |

* Twelve months ended Sept. 30.

MASSACHUSETTS COMPANY TO ISSUE STOCK.—Stockholders of the Lynn Gas

## *Stock Quotations of Electric Light and Power and Manufacturing Companies*

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Monday Nov. 21 | Low 1927 | High 1927 |
|---|---|---|---|
| **ABITIBI PWR. & PAPER, 4% com.—no par** | 136½ | 83 | 141½ |
| Adirondack Pwr. & Lt.—7% pf. | 111 | 107 | 113½ |
| Adirondack Pwr. & Lt.—8% pf. | 114 | 112 | 116 |
| Ala. Pwr., $7 cum. pf.—no par | 112 | 107 | 112½ |
| Allis-Chalmers Mfg., 6% com. | 114½ | 88 | 118½ |
| Aluminum Co. of Amer., com | 113½ | 67½ | 113½ |
| Aluminum Co. of Amer., 6% pf. | 104 | 101½ | 104½ |
| Amer. & Foreign Pwr., pf. 25% pd. | m110 | .... | .... |
| Amer. & Foreign Pwr., 7% pf.—no par | 106 | 86½ | 108 |
| Amer. & Foreign Pwr., com.—no par | 28 | 18½ | 30½ |
| Amer. Bosch Magneto, com.—no par | 23½ | 13 | 26½ |
| Amer. Brown Boveri Elec† | ♣15½ | 5½ | 39½ |
| Amer. Brown Boveri Elec., pf. $7 | 67 | 40 | 98 |
| Amer. Gas & Elec., 6% pf.—no par | 105½ | 95½ | 105½ |
| Amer. Gas & Elec., com.†—no par | 118 | 68½ | 118 |
| Amer. Lt. & Trac., 6% pf. | 112 | 112 | 120 |
| Amer. Lt. & Trac., new com. | 177 | 164½ | 186 |
| Amer. Pwr. & Lt., 6% pf. | 107½ | 97½ | 108½ |
| Amer. Pwr. & Lt., com.†—no par | 66½ | 54 | 73½ |
| Amer. Pub. Serv., 7% pf. | a100½ | 94 | 104 |
| Amer. Pub. Serv., com.† | 70 | 65 | 75 |
| Amer. Pub. Utilities, 7% pfc. pf | a 88½ | 73 | 90 |
| Amer. Pub. Utilities, 7% pr. pf. | a 94½ | 92 | 96 |
| Amer. Pub. Utilities, com. | ♣ 57 | 65 | 70 |
| Amer. States Sec., A | 5 | 2½ | 4½ |
| Amer. States Sec., B | 4½ | 2½ | 4½ |
| Amer. Superpwr., 6% pfc pf.—25 | ♣ 29 | 26½ | 29½ |
| Amer. Superpwr., 6% 1st pf. | ♪ 99½ | .... | .... |
| Amer. Superpwr., Class A†—no par | 40 | 27½ | 41½ |
| Amer. Superpwr., Class B†—no par | 41 | 28½ | 43 |
| Amer. Wtr. Wks. & Elec., 6% pf. | 101½ | 99½ | 101½ |
| Amer. W. W. & E., com. new—no par | 61½ | 46 | 72½ |
| Anaconda Copper cap. $3 | 52½ | 41½ | 52½ |
| Appalachian Electric Pwr., 7% pf. | 106½ | 100 | 105 |
| Arizona Pwr., 7% pf. | ♣ 85 | 77 | 88 |
| Arizona Pwr., com. | m 20 | .... | .... |
| Arkansas Pwr. & Lt. 7% pf. | 106 | .... | .... |
| Assoc. Gas & Elec., $3.50—50 | 51½ | .... | .... |
| Assoc. Gas & Elec., pf.—$6—no par | 93 | 85 | 96 |
| Assoc. G. & E., Class A, 10—no par | 44½ | 35 | 44½ |
| **BABCOCK & WILCOX, 7% com.** | 131 | 113 | 132 |
| Binghamton L., H. & P., $6 pf. | 100 | 93 | 102 |
| Birmingham Elec., pf.—$7—no par | 109½ | 105 | 110 |
| Blackstone Valley G. & E., 6% pf. | 107 | 103 | 105 |
| Blackstone Valley Gas & Elec., 10% com.—50 | ♣128 | 98 | 153 |
| Blaw-Knox, com.† | ♦ 95 | 70 | 96½ |
| Brazilian Trac., Lt. & pwr., com.† | ƒ212 | .... | .... |
| Broad River Pwr., 7% pf. | 103 | 97 | 104½ |
| Brooklyn Edison, 8% com. | 188½ | 148½ | 188½ |
| Buffalo, Niagara & East. Pwr., $1.60 pf.—25 | ♪ 25 | .... | .... |
| Buffalo, Niagara & East. Pwr. com. $1—no par | ♪ 32½ | .... | .... |
| **CALIFORNIA ELEC. GENERATING, 6% pf.** | 99 | 96 | 99½ |
| California Ry. & Pwr., 7% pf. | 135 | 125 | 150 |
| Carolina Pwr. & Lt., pf.—$7—no par | ƒ109½ | 107 | 109 |
| Central & S.W. Util., $7 pf.—no par | a 97½ | 92½ | 99 |
| Central & S.W. Util., pr.ln.$7 pf.—no par | a102 | 98½ | 104½ |
| Central Ark. Ry. & Lt., 7% pf. | 106 | 100 | 104 |
| Central Ill. Pub. Serv., $6 pf | a 93½ | 88½ | 95½ |
| Central Ind. Pwr., 7% pf. | a 95 | 85½ | 95 |
| Central Maine Power, 6% pf. | 94 | .... | .... |
| Central Maine Power, 7% | 107 | 102 | 106 |
| Central Pwr. & Lt., 7% pf. | 102 | 100½ | 103 |
| Central States Elec., 7% pf. | 99½ | 93 | 97 |
| Central States Elec., com.† | m 29½ | 17½ | 30½ |
| Century Elec., 6% com. | b136½ | 114 | 162 |
| Chicago Fuse Mfg., com.—$2.50 no par | m 31 | 30 | 35½ |
| Cincinnati Gas & Elec., 5% com. | g100½ | 96½ | 100½ |
| Cities Service, $6 pf—no par | g 95½ | 87 | 94½ |
| Cities Service, pf. B—no par | ♪ 8½ | 8 | 8½ |
| Cities Service, pf. BB—no par | ♪ 88 | 80½ | 86 |
| Cities Service, com.—20 | ♪ 51½ | 40½ | 58½ |
| Cities Service, Bks. Shrs.—10 | ♪ 25½ | 22½ | 27 |
| Cities Service Pwr. & Lt., 7% pf. | 104 | 100½ | 104 |
| Cities Service Pwr. & Lt., 6% pf. | 93½ | 90 | 93½ |
| Clarion River Pwr., 8% pf. | 95 | .... | .... |
| Cleveland Elec. Illu., 6% pf. | 110 | 108 | 112 |
| Cleveland Elec. Illu., 10% com. | 330 | 285 | 340 |
| Columbia Gas & Elec., 6% pf. | 108½ | 99½ | 108½ |
| Columbia G. & E. com. $5—no par | 93½ | .... | .... |
| Columbia Ry., Gas & Elec., 6% pf. | m 98 | 97 | 100 |
| Columbus Elec. & Pwr., $2 com.—no par | 64 | .... | .... |
| Columbus Elec. & Pwr., 7% pf. | 109 | .... | .... |
| Columbus Ry., Pwr. & Lt., 6% 1st pf. | 104 | 98½ | 106 |
| Columbus Ry., Pwr. & Lt., 6½% pf. B | 103 | 96 | 104 |
| Columbus Ry., P. & L., com.—no par | 100 | 75 | 105 |
| Commonwealth Edison, 8% com. | g166½ | 138 | 171 |
| Commonwealth Pwr., 6% pf. | 101½ | 91½ | 103½ |
| Commonw'th Pwr., $2, com.—no par | 67½ | 48½ | 78½ |
| Conn. Lt. & Pwr., 8% pf. | 121 | 119 | 123 |
| Conn. Lt. & Pwr., 7% pf. | 117 | 112 | 118 |
| Cons. Gas of N. Y., pf. | 100½ | 93 | 100½ |
| Cons. Gas of N. Y., com $5—no par | 115½ | 94 | 121½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf. | e111 | 111 | 111½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf. | e112 | 110½ | 114½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf. | e115 | 112½ | 117 |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf. | e128½ | 127 | 130½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par | e 68½ | 51 | 71 |
| Consolidated Pwr. & Lt., 7% pf. | 105 | 100 | 106 |
| Consumers Pwr., 6% pf. | 104 | 100 | 102 |
| Consumers Pwr., 6.6% pf. | 106 | 103 | 105½ |
| Continental Gas & Elec., 8% pfc. pf. | 108 | 103 | 106½ |
| Continental Gas & Elec., 7% pr. pf. | 104 | 100 | 103 |
| Conti. G. & E. com. $4.40—no par | ♣230 | 210 | 225 |
| Crocker Wheeler, com.† | 25 | 23 | 38 |
| Crocker Wheeler, 7% pf. | 80 | 78 | 88 |
| **DALLAS PWR. & LT., 7% pf.** | 109 | 107 | 110½ |
| Dayton Pwr. & Lt., 6% pf. | 108 | 101 | 109 |
| Detroit Edison, 8% com. | 161½ | 133½ | 161½ |
| Dubilier Condenser, com.—no par | 2½ | 2½ | 5½ |
| Duke Pwr., cap. | 125½ | .... | .... |
| Duquesne Lt., 7% pf. | 117 | 114½ | 117½ |
| **EASTERN NEW YORK UTIL., $7 pf.** | 107 | 102 | 104½ |
| Eastern New York Util. com. | 65 | 70 | 75 |
| Eastern States Pwr., $7, com. | 13 | 9 | 14 |
| Eastern States Pwr., pf. | 96 | 90 | 95 |
| East. Tex. Elec., 7% pf. | 106 | 106 | 108 |
| Edison Elec. of Boston, $12 com. | d249½ | 217 | 267 |
| El Paso Elec., 7% pf. | 108 | 105 | 107½ |
| Elec. Bond & Share, 6% pf. | dlC9 | 105½ | 110½ |
| Elec. Bd. & Sh. Sec., com. $1—no par | ♪ 76½ | 67½ | 80½ |
| Electric Household Util.† | a 13½ | 11 | 15½ |
| Elec. Investors, 6% pf.—no par | 98½ | 92 | 97 |
| Elec. Investors, com.†—no par | 43½ | 32½ | 44½ |
| Elec. Pwr. & Lt., ctfs. pf. | ♣ 106 | 96 | 106½ |
| Elec. Pwr. & Lt., ctfs., 40% pd. | ♣ 116½ | 103½ | 119 |
| Elec. Pwr. & Lt., ctfs., com.—no par | 27½ | 16½ | 29½ |
| Elec. Refrig. cap.† | 8½ | 5½ | 37½ |
| Elec. Ry. Securities, com.—no par | 6 | .... | .... |
| Elec. St. Battery com. $5.25—no par | 71½ | 63½ | 79½ |
| Elmira Wtr., Lt. & R.R., 7% pf. | 104½ | 99 | 101½ |
| Emerson Elec., pf. | m109 | 107½ | 111 |
| Empire Pwr., ptc.† | 35 | 26 | 39 |
| Engr. Pub. Serv., $7 pf.—no par | ♣107 | 93½ | 108½ |
| Engr. Pub. Serv., com.—no par | 35½ | 21½ | 39½ |
| Eureka Vacuum Cleaner, com. $4—no par | 72½ | 50 | 77 |
| **FAIRBANKS MORSE, 7% pf.** | ♣108 | 107½ | 112 |
| F.-M., com.—$3—no par | 35½ | 30½ | 43½ |
| Federal Lt. & Trac., com. $1.40 | 38½ | 37½ | 47 |
| Federal Lt. & Trac., $6 pf.—no par | 98½ | 91½ | 100 |
| Florida Pwr. & Lt., 7% pf. | ♣104½ | 100 | 102½ |
| Ft. Worth Pwr. & Lt., 7% pf. | ♣112 | 108 | 112 |
| **GALVESTON-HOUSTON ELEC. 6% pf.** | 77 | 66 | 79½ |
| Galveston-Houston Elec., com. | 35 | 26 | 32 |
| Gen. Elec., $3 com.—no par | 132½ | 81 | 146½ |
| Gen. Elec., special—6% | 11½ | 11 | 11½ |
| Gen. Gas & Elec. (Del.) com. A, $1.50—no par | ♣ 37½ | 34 | 47½ |
| Gen. G. & E. (Del.) com. B—no par | m 45 | 35½ | 44 |
| Gen. G. & E. (Del.) pf. A, $6—no par | ♣122 | 113½ | 121 |
| Gen. G. & E. (Del.) pf. A $7—no par | ♣109 | 100 | 110½ |
| Gen G. & E. (Del.) pf. B $7 | ♣104 | 96 | 105 |
| Gen: Pub. Serv., $7 cum. pf., no par | ♣110 | 102 | 106 |
| Gen. Pub. Serv., com., no par | 15½ | 11½ | 18 |
| Ga. Lt., Pwr. & Rys., 6% pf. | 95 | 87 | 98 |
| Ga. Lt., Pwr. & Rys., com. | m 50 | 50 | 80 |
| Ga. Ry. & Pwr., 8% pf. | ♣125 | 119 | 125 |
| Ga. Ry. & Pwr., 7% pf. | ♣113½ | 106 | 110 |
| Gt. Western Pwr., 7% pf. | ♣105 | .. | .. |
| **IDAHO PWR., 7% pf.** | 108½ | 103 | 109 |
| Ill. No. Utilities, 6% pf. | ♣ 96 | 88 | 97 |
| Ill. Pwr. & Lt., 7% pf. | 102 | 99 | 101½ |
| Ingersoll Rand 6% pf. | 114 | 106½ | 120 |
| Int. Combus. Engr., com. $2—no par | 49½ | 40½ | 64 |
| Int. Combustion Ener., 7% pf. | 102 | 101 | 102 |
| Int. Util., Class A—$3.50—no par | ♣46½ | 24 | 47½ |
| Int. Utilities, Class B—no par | 8½ | 3 | 9½ |
| Interstate Pwr., pf.—$7—no par | 96½ | 93 | 98 |
| Interstate Pub. Serv., 7% pf. | 101 | 98 | 99½ |
| Iowa Ry. & Lt., 7% pf. | ♣ 98 | 97 | 99 |
| **JERSEY CENTRAL PWR. & LT. CO., 7% pf.** | 106½ | 100 | 106½ |
| Johns-Manville, com.†—no par | 117½ | 55½ | 123½ |

Stock Exchange: gChicago; ♣St. Louis; ePhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; dPittsburgh; ƒWashington. ♣Bid price Saturday, Nov. 19. ♪Bid price Tuesday, Nov. 22. mLatest quotations available. †Dividend rate variable.

## *Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)*

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Monday Nov. 21 | Low 1927 | High 1927 |
|---|---|---|---|
| **KANSAS CITY PWR. & LT. pf.$7** | 115¼ | 112 | 116 |
| Kansas Gas & Elec., 7% pf. | *l*108 | 103 | 107½ |
| Kentucky Hydro-Elec., 7% pf. | *a*103½ | 94½ | 104 |
| Kentucky Sec.,6% pf. | 86 | 83 | 87 |
| Kentucky Sec., 5% com. | 115 | 110 | 115 |
| Kentucky Utilities, 6% pf. | 100 | 95 | 101 |
| Keystone Pwr. & Lt., pf. | *m*98 | 95 | 100 |
| **LACLEDE GAS LT., 12% com.** | 225 | 173¼ | 267½ |
| Lehigh Pwr. Sec., com.—no par. | 21½ | 15 | 22 |
| Long Island Ltg., 7% pf. | 110½ | 107 | 112 |
| Long Island Ltg., com.†—no par | 168 | 139 | 180 |
| Los Angeles Gas & Elec., 6% pf. | 103 | 98 | 104½ |
| Louisville Gas & Elec., cl. A. $1.75 | 26½ | 23¼ | 27½ |
| **MAN. ELEC. SUPPLY, cap. $5 —no par** | 58½ | 43 | 132 |
| Manila Elec., com.†—no par | *k* 50 | 40 | 60 |
| Maytag Mfg., com. .50—no par | 30½ | 23¼ | 34½ |
| Memphis P. & L., pf.—$7—no par | 109½ | 107 | 109 |
| Metropolitan Ed., pf.—$6—no par | 104 | 93 | 100 |
| Metropolitan Ed., pf.—$7—no par | 109 | 104 | 108 |
| Metropolitan Ed., com. $5—no par | 70 | 60 | 72 |
| Middle West Utilities, 7% pf. | *a*118 | 110¼ | 118½ |
| Middle West Util., 8% pr. lien | *a*126½ | 117½ | 127 |
| Middle West Util., com. $6—no par | *a*120½ | 108 | 117½ |
| Midland Utilities, pr. ln. 7% pf. | *a*105 | 97½ | 107½ |
| Midland Utilities, 7% pf. A. | *a*100½ | 96½ | 103½ |
| Milwaukee Elec. Ry. & Lt., 7% pf. | *k*102 | 100 | 103 |
| Milwaukee Elec. Ry. & Lt., 6% pf. | *k* 98½ | 98 | 101½ |
| Minn. Pwr. & Lt., 7% pf. | *l*108 | 104 | 107½ |
| Miss. Pwr. & Lt., $8 pf. | *m*101 | 106 | 103 |
| Miss. River Pwr., 6% pf. | 104 | 94 | 104½ |
| Miss. River Pwr. 3% com. | 62 | .... | .... |
| Mohawk Hudson Pwr., 1st pf.—$7 —no par | 106 | 100 | 109 |
| Mohawk Hudson Pwr., 2d pf.—$7 —no par | 112 | 98 | 112 |
| Mohawk Hudson Pwr., com.—no par | 28½ | 20¼ | 32½ |
| Montana Pwr., 5% com. | 103½ | 81½ | 109½ |
| Montreal Pwr., 7% com. | *f* 91 | .... | .... |
| Mountain States Pwr., 7% pf. | 100½ | 97 | 101 |
| Mountain States pwr., com.† | 18 | .... | .... |
| **NASSAU & SUFFOLK LTG., 7% pf.** | 107 | 98 | 110 |
| National Carbon, 8% pf. | *a*137 | 130½ | 139½ |
| National Elec. Pwr., Af. | *a* 27½ | 22 | 28½ |
| National Lt., Ht. & Pwr., com. | 24 | .... | .... |
| National, Light, Ht. & Pwr., 5% pf. | *k* 70 | .... | .... |
| National Pwr. & Lt., pf.—$7—no par | 109½ | 101 | 110 |
| National Pwr. & Lt., com.†—no par. | 23½ | 19½ | 26½ |
| National Pub. Serv., 7% pf. | 100½ | 93 | 100 |
| National Pub. Serv., 7% ptc., pf. | 114 | 108 | 115 |
| National Pub. Serv., A com. $1.60—no par | 22½ | 18½ | 24 |
| National Pub. Serv., B com.—no par | *k* 32½ | 14 | 34½ |
| Nebraska Pwr., 7% pf. | *l*110 | 106 | 109½ |
| Nevada-Calif. Elec., com. | *k* 32½ | 25 | 36½ |
| New Brunswick Pwr., 4% pf. | 60 | .... | .... |
| New Eng. Pub. Serv., pr. ln. pf. $7.. | 101 | 98½ | 102 |
| New Eng. Pub. Serv., pf. $7. | 98 | 95 | 99 |
| New Orleans Pub. Serv.—7% pf. | 106 | 103 | 105½ |
| N. Y. & Queens Elec. Lt. & Pwr., 5% pf. | 90 | 91 | 97 |
| N. Y. Central Elec., 7% pf. | 102½ | 101 | 104 |
| Newport News & Hampton Ry., Gas & Elec., 5% com. | 109 | .... | .... |
| Newport News & Hampton Ry., Gas & Elec., 7% pf. | 109 | .... | .... |
| Niagara Falls Pwr., 7% pf.—25. | *k* 28½ | 27½ | 29½ |
| Niagara, Lock. & Ont. Pwr., 7% pf. | 114 | 112½ | 116 |
| No. Amer., 6% pf.—50. | 54½ | 50 | 55 |
| No. Amer., com.—10 | 61½ | 45¼ | 64½ |
| No. Amer. Edison, $6 pf.—no par. | *k*103½ | 96½ | 105 |
| No. Caro. Pub. Serv., pf.—$7—no par | 100½ | 93 | 102½ |
| Northeastern Pwr., com. | 23 | 14½ | 25 |
| No. N. Y. Utilities, 7% pf. | 105½ | 103 | 109 |
| No. Ohio Pwr. com.—no par. | 17½ | 9½ | 18½ |
| No. Ont. Lt. & Pwr., 6% pf. | *k* 93½ | 84 | 95 |
| No. Ont. Lt. & Pwr., 4% com. | 72 | 73 | 78 |
| No. States Pwr., (Del.) 7% pf. | 110 | 100½ | 110 |
| No. States Pwr., (Del.) 8% com. | 127 | 109½ | 133 |
| No. Texas Elec., 6% pf. | *k* 45 | 65 | 70 |
| No. Texas Elec., com. | *k* 5 | 27 | 36 |
| **OHIO BRASS, com. B $4—no par.** | 107 | 76 | 109½ |
| Ohio Brass, 6% pf. | 105½ | 100 | 107 |
| Ohio Pwr., 6% pf. | 103 | 96 | 103 |
| Ohio Pub. Serv., $6 pf. | 100½ | 95 | 96½ |
| Ohio Pub. Serv., 7% pf. | 109½ | 103 | 109 |
| Ohio River Edison, 7% pf. | 109 | 103 | 109½ |
| Oklahoma Gas & Elec., 7% pf. | 106 | .... | .... |
| **PACIFIC GAS & ELEC., 6% pf.** | 26½ | 24½ | 27½ |
| Pacific Gas & Elec., 8% new com. | 45½ | 31 | 46 |
| Pacific Pwr. & Lt., 7% pf. | *l*105 | 102 | 104½ |
| Penn Cent. Lt. & Pwr., $5 pf.—no par | *c* 79 | 75½ | 80 |
| Penn-Ohio Edison, 6% pf. no par. | 91 | 80½ | 91 |
| Penn-Ohio Edison, 7% pf. | 110½ | 97½ | 110½ |
| Penn-Ohio Elec., 7% pf. | *m*102 | 99 | 103 |
| Penn-Ohio Pwr. & Lt., 7% pf. | 108 | 99 | 110 |
| Penn Pwr. & Lt.—$7—no par. | *l*110½ | 107 | 110 |
| Penn Wtr. & Pwr., 8% com., new. | *c* 68 | 47½ | 73½ |
| Phila Co., 5% pf.—50. | *c* 47 | 40 | 47 |
| Phila. Co., 6% pf.—50. | *c* 52½ | 49 | 54 |
| Phila. Co., com.—50. | *k*125 | 85½ | 132 |
| Phila. Elec., 8% com.—25. | *c* 54½ | 46½ | 58½ |
| Portland Elec. Pwr., 7% pf. | 100 | 97½ | 102½ |
| Portland Elec. Pwr., 6% pf. | 75 | 78 | 84 |
| Portland Elec. Pwr., 6% 2d pf. | 65 | 55 | 70 |
| Portland Elec. Pwr., com. | 30 | 22 | 30 |
| Potomac Elec. Power, pf., ex. div. | *l*111½ | .... | .... |
| Pwr. Sec., pf.—no par. | *k* 53 | 28 | 57 |
| Pwr. Sec., com.—no par. | *k* 12 | 5 | 15 |
| Public Serv. of Colorado, 7% pf. | *l*104 | 99 | 103 |
| Pub. Serv. of N. J., 6% pf. | *k*104 | 98½ | 105 |
| Pub. Serv. of N. J., 8% pf. | *k*134 | 125 | 135½ |
| P. S. of N. J., $2 com.—no par. | 42½ | 32 | 46½ |
| Pub. Serv. of No. Ill., 6% pf. | *a*110½ | 101½ | 110½ |
| Pub. Serv. of No. Ill., 7% pf. | *a*119 | 112½ | 119 |
| P. S. of No. Ill., com. $8—no par. | *a*156½ | 140½ | 161½ |
| Pub. Serv. of No. Ill., $8 com | *a*157 | 132 | 161½ |
| Pub. Serv. of Okla., 7% pr. ln. | 102 | 90 | 103 |
| Pub. Serv. Elec. & Gas, 6% pf. | 109½ | 102 | 110 |
| Puget Sound Pwr. & Lt., 7% pr. pf. | 110½ | 103½ | 111 |
| Puget Sound Pwr. & Lt., $6 pf.—no par | 89 | .... | .... |
| Puget Sound Pwr. & Lt., com. | 36 | 28 | 38½ |
| **RADIO CORP. OF AMER., $3.50 pf.—50** | 56½ | 49 | 56½ |
| Radio Corp. of Amer., com.—no par. | 87½ | 41½ | 87½ |
| Republic Ry. & Lt., pf. | *m*120 | .... | .... |
| Republic Ry. & Lt., com. | *m*135 | 112 | 135 |
| Rochester Gas & Elec., 6% pf. D. | 105 | 101 | 103½ |
| Rochester Gas & Elec., 7% pf. B. | 104½ | 105 | 107 |
| Rochester Gas & Elec., 6% pf. C. | 104½ | 101½ | 103½ |
| **SAFETY CABLE, com. $4.** | 58½ | 52½ | 74½ |
| San Joaquin Lt. & Pwr., 7% pr. pf. | 111 | 105 | 112½ |
| St. Joseph Ry., L., H. & P., 5% pf. | 75 | 70 | 75 |
| Servel Corp. | 14cts | 10cts | 10½ |
| Sierra Pacific Elec., 2% com. | *k* 29 | 24½ | 31½ |
| Sioux City Gas & Elec., 7% pf. | 105½ | 99 | 105½ |
| Southeastern Pwr. & Lt., pf.—$7 no par | *l*109½ | .... | .... |
| Southeastern Pwr. & Lt., ptc. pf. | *l* 84½ | .... | .... |
| Southeastern Pwr. & Lt., com.—no par | 46 | 29½ | 46 |
| So. Calif. Edison, 8% pf. | 40 | 36½ | 40 |
| So. Calif. Edison, 7% pf. | 28½ | 27½ | 29½ |
| So. Calif. Edison, 6% pf. | 25½ | 24½ | 26½ |
| So. Calif. Edison, 8% com. | 40½ | 31½ | 41 |
| Southern Cities Utilities, 7% pf. | *k* 74 | 67 | 90½ |
| Southern Cities Utilities, com. $4. | *m* 32½ | 31 | 42½ |
| Southwestern Lt. & Pwr., A $3. | 63 | 60 | 65 |
| Southwestern Lt. & Pwr., B. | 63 | 60 | 65 |
| Southwestern Lt. & Pwr., $6 pf. | 88 | 83 | 91½ |
| Southwestern Pwr. & Lt., 7% pf. | 111½ | 104 | 115 |
| Springfield (Mo.) Ry. & Lt., 7% pf. | 102 | 95 | 102 |
| Standard Gas & Elec., 8% pf. | 66 | 57½ | 66½ |
| Standard Gas & Elec., 7% pr. pf. | 109½ | 104½ | 113½ |
| Standard G. & E., com. $3.50—no par | 61½ | 54 | 65½ |
| Standard Power & Light, com. | 30½ | 22 | 30½ |
| Standard Pwr. & Lt., 7% pf. | 102 | 98 | 102½ |
| Staten Island Edison, pf.—$6—no par | 100 | 99 | 101 |
| Superheater, $6 com.—no par. | 171 | 170 | 185 |
| Syracuse Lighting, 7% pf. | 110 | 103 | 107 |
| Syracuse Lighting, 8% pf. | 117½ | .... | |
| Syracuse Lighting, 8% com.—no par | *m*300 | .... | .... |
| **TAMPA ELEC., com. $2.** | 63 | 49 | 64½ |
| Tenn. Elec. Pwr., 6% pf. | 100 | 92 | 100 |
| Tenn. Elec. Pwr., 7% pf. | 108 | 103 | 109 |
| Terre Haute, Ind. & East. Trac., 5% pf. | 26 | 20 | 30 |
| Terre Haute, Ind. & East. Trac., com | 1 | 1 | 3 |
| Tex. Pwr. & Lt., 7% pf. | *l*113 | 104 | 112 |
| Tide Water Pwr., 8% pf. | 109 | 105 | 110 |
| Timken Roller Bear., com.—$4 no par | 118½ | 78 | 142½ |
| Toledo Edison, 7% pf. | *l*109½ | 102 | 107 |
| Toledo Edison, 6% pf. | *k*100 | 95 | 97 |
| Toledo Edison, 6% com. | 100 | .... | .... |
| Tri-City Ry. & Lt., 6% pf. | 96½ | 96 | 99 |
| **UNITED GAS & ELEC., 6% pf.** | 101 | 98 | 102 |
| United Gas & Elec. (N. J.) 5% pf. | 70 | 70 | 75 |
| United Gas Impr., 8% com.—50. | *c* 110½ | 89½ | 118½ |
| United Lt. & Pwr., pf.—$4—no par. | *k* 53 | 49 | 55 |
| United Lt. & Pwr., pf.—$6.50—no par | 92 | 87 | 97½ |
| United L. & P., com. A .48—no par. | 14½ | 12½ | 15½ |
| United L. & P., com. B .48—no par. | *a* 19 | 14 | 20 |
| Utah Pwr. & Lt., 7% pf. | *l*109 | 104 | 108½ |
| Utica Gas & Elec., 7% pf. | 105 | 105 | 106½ |
| Utica Gas & Elec., 8% com. | 200 | .... | .... |
| Utilities Pwr. & Lt., 7% pf. | 97 | 93 | 100 |
| Utilities Pwr. & Lt., com. A $2. | 30½ | 27 | 34 |
| Utilities Pwr. & Lt., com. B $1—no par | 22 | 13½ | 23½ |
| **VERMONT HYDRO-ELEC., 7% pf.** | 93 | 95 | 100 |
| Virginia Elec. & Pwr., 7% pf. | 108 | 105 | 110 |
| Virginian Pwr., 7% pf. | *m*108 | .... | .... |
| Virginian Pwr., com. | 75 | .... | .... |
| **WAGNER ELEC., 7% pf.** | *g* 87 | 68 | 90 |
| Wagner Elec., com.—no par. | *b* 31 | 18½ | 39½ |
| Washington Ry. & Elec., 5% com., ex. div. | *g*443 | ... | .... |
| Washington Ry. & Elec., 5% pf., ex. div. | *g*99½ | .... | .... |
| Washington Wtr. Pwr., 8% com. | 167 | 136 | 182 |
| West Penn Elec., 7% pf. | 110½ | 102 | 112 |
| West Penn Elec., Cl. A $7. | 109 | 97½ | 110 |
| West Penn Pwr., 7% pf. | *k*115½ | 111 | 118 |
| West Penn Pwr., 6% pf. | 108½ | 100½ | 109 |
| West Virginia Lt., Ht. & Pwr., 7% pf. | 95 | 94 | 100 |
| West Va. Utilities, 7% pf.—50. | *m* 90 | 48 | 51½ |
| Western Pwr., 7% pf. | *k*101 | 98 | 101½ |
| Western States Gas & Elec., 7% pf. | 103 | 96 | 105 |
| Western States Gas & Elec., com. | 37 | .... | .... |
| Westinghouse Elec. & Mfg., 8% com. —50 | 85½ | 67½ | 89½ |
| Weston Elec. Instrument, Cl. A $2 —no par | 33 | 30 | 34½ |
| Weston Elec. Instrument, com.—no par | 14½ | 11 | 18½ |
| Wheeling Elec., 6% pf. | 103 | 95 | 104 |
| Worthington Pump, 7% pf. A. | 48 | 46 | 61½ |
| Worthington Pump, 6% B. | 40½ | 37 | 54½ |
| Worthington Pump, com. | 31½ | 20½ | 46 |
| **YALE & TOWNE com. $5—25.** | *k* 76 | 70½ | 84½ |

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Nov. 19. *l*Bid price Tuesday, Nov. 22. *m*Latest quotations available. †Dividend rate variable.

& Electric Company have voted to authorize the issuance of 19,500 additional shares of capital stock at a par value of $25 in the ratio of one share for each five now held. The new stock is to be offered to present stockholders at $75 a share.

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PUBLIC UTILITY PROPERTIES IN GEORGIA VALUED AT $205,000,000.—Public utilities stand third among the various classes of property in Georgia in valuation, according to figures just given out by the comptroller general. The value of public utilities in the state for 1927 was $205,383,239, this figure being exceeded only by city and town property, with a valuation of more than $448,000,000, and land, with a valuation of approximately $300,000,000. Not only did public utilities stand third on the list, but they showed the highest gain in valuation of any classification. With a 1927 valuation of $205,383,239 as compared with a valuation in 1926 of $195,343,481, public utilities in the state registered the unusual gain of more than $10,000,000.

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ALABAMA POWER PREFERRED SHARES TO BE CONVERTED.—According to the plan formulated to consolidate the Gulf Electric Company and the Houston Power Company with the Alabama Power Company, referred to recently under "Purchases and Mergers," preferred shares of the Alabama Power Company will be converted into shares of preferred stock of the consolidated company share for share, having the same dividend rates, priorities and redemption price. There is also created a five-dollar preferred stock having similar preferences, to be sold at a later time when the stock may be disposed of to the advantage of the company. In commenting on the consolidation Thomas W. Martin, president of the Alabama Power Company, said: "Additions must be made from year to year and plants and lines built in order to keep pace with the growth of the state. This makes it necessary to raise large amounts of additional capital each year by the sale of bonds and stocks, and the directors of the companies feel that the cost of additional capital required for the extension of the service can be obtained on a very much better basis if the properties of all the companies are consolidated."

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PACIFIC GAS & ELECTRIC TO EXCHANGE STOCK.—With the intention of ultimately dissolving the companies, the Pacific Gas & Electric Company has applied to the California Railroad Commission for permission to exchange its own $25 par value, 6 per cent preferred

stock for $100 par value, 7 per cent preferred of the Coast Valleys Gas & Electric Company and the Western States Gas & Electric Companies of California and Delaware, recently acquired from the Standard Gas & Electric Company. Exchange will be on a four-for-one basis and will involve 20,774 shares of Coast Valleys Gas & Electric Company, 46,250 shares of Western States Gas & Electric Company of California and 17,874 shares of Western States Gas & Electric Company of Delaware. The transaction requires 339,592 shares of Pacific Gas & Electric Company stock with a par value of $8,489,800.

# Urges Utilities Be Legalized as Savings Bank Investment

## Scarcity of Authorized Security Issues Available for This Purpose in New York State Has Created a Situation That Should Be Met

THE rapidly increasing volume of funds available for investment in the face of a shortage in legal investments was the subject of a statement made by H. F. Wilson, Jr., vice-president of the Bankers' Trust Company, to a committee of the New York Legislature appointed to investigate that situation. Mr. Wilson pointed out that the rapid rate of retirement of government bonds has meant an eight-billion-dollar drop in bonds available for savings bank and trustee investment over an eight-year period. While life insurance companies may invest in utility issues, savings banks are denied the privilege, and the situation, according to Mr. Wilson, is one which demands attention.

"For several years," he says, "the savings banks of New York State have been endeavoring, in the interest of their depositors, to have enlarged the list of investments legal for savings banks. During the same period trustees, and especially corporate trustees, have been seconding the application of the savings banks, so to speak, in order that trustees might be able to obtain a better yield for their beneficiaries, many of whom are widows and others dependent upon income from this source. I have not yet heard any good reason why this action should not be taken by the Legislature by including among the investments legal for savings banks and consequently for trustees (with, of course, proper safeguards) public utility and telephone bonds and railroad equipment obligations, and I should also feel that bonds collaterally secured by bonds which are legal, with a proper margin, of course, should likewise qualify.

### New York Behind

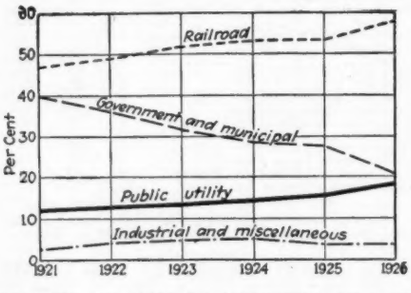
"Eighteen states have authorized trustees to invest trust funds in carefully selected bonds of public utility companies, and New York, the Empire State, has not only not taken the lead, but thus far has not even followed the example of these other states, where the need is not so urgent as it is in New York.

"It seems to me that when such states as Colorado, Connecticut, Delaware, Florida, Illinois, Kentucky, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, Ohio, Rhode Island, Wisconsin, Maine, Minnesota, Vermont and Washington have taken action to broaden the list of investments legal for savings banks and trustees, the Legislature of New York should follow in line, and while not opening the door too wide, at least adopt the bills which have been so carefully prepared in the interest of savings banks and trustees, and particularly in behalf of their hundreds of thousands of depositors and dependents on income.

"I hope that this joint legislative committee, composed of progressive members of both the Senate and Assembly, will take favorable action in recommending adoption of this much-needed legislation."

## Utility Bonds Pass Tests of Insurance Companies

That public sentiment throughout the nation is rising to a more enlightened appreciation of the investment merits of utility bonds is seen in the growing




RELATIVE CHANGES IN SECURITIES HELD BY 25 LEADING INSURANCE COMPANIES

accumulation of these issues by fiduciary institutions. That America's 25 largest insurance companies—investors par excellence—have increased their holdings by 60 per cent in the past five years, as shown in an elaborate and highly enlightening study made by Bonbright & Company, is most significant. The study shows that at the close of 1926 the 25 largest life insurance companies in the United States and Canada held bonds of the electric power and light, gas, street-railway and telephone companies in a total amount of over $943,000,000, representing 20.1 per cent of their aggregate bond investments. Five years earlier the corresponding proportion was only 7.7 per cent.

CONNECTICUT UTILITY CHANGES SET-UP.—Stockholders of the Connecticut Light & Power Company have voted to change the authorized and unissued preferred stock, which amounts to $2,500,000, to authorized and unissued common stock, thereby increasing the common stock capitalization from $18,500,000 to $21,000,000. It was also voted to increase the common stock capitalization from $21,000,000 to $40,000,000 and to increase the preferred stock, par $100, to $30,000,000 from $15,000,000.

COMMONWEALTH EDISON COMPANY TO ISSUE ADDITIONAL STOCK.—Directors of the Commonwealth Edison Company voted Oct. 19 to ask authority from the Illinois Commerce Commission to issue additional stock to the extent of 12½ per cent of the present outstanding stock. The new stock will be offered at par to stockholders early next year.

RECENT LISTINGS.—The New York Stock Exchange has authorized the listing on or after Oct. 31 of $393,550 additional common stock of the Philadelphia Company (par $50) on official notice of issuance as a stock dividend, making the total amount applied for to date $47,613,850. There has also been authorized the listing of not to exceed 54,542 additional shares of common stock of the Standard Gas & Electric Company (without par value), making the total amount applied for not to exceed 1,708,368 shares of common stock. The Boston Stock Exchange has authorized the listing of additional first mortgage 5 per cent gold bonds of the Central Power & Light Company, 1956 series, to the amount of $4,064,500 and also the listing of convertible gold debentures, series A, of the American Electric Power Corporation to the amount of $6,500,000.

INDUSTRY AND GOVERNMENT SPEND SUBSTANTIAL SUM ON RESEARCH WORK.—About $200,000,000 annually is being spent in the United States for industrial research by industrial corporations and by the federal government, with industry spending $2 for every one spent by the government, according to information collected by the National Industrial Conference Board, New York, incidental to a study of industrial organization. So rapid has been the extension of research work as a necessary auxiliary to industrial management and technique that, whereas in 1921 only 578 companies were known to maintain research departments or laboratories, more than 1,000 concerns have organized research divisions in operation at the present time. In addition, 70 trade associations are spending about $15,000,000 a year in research, and 152 colleges and technical schools about $1,500,000. Furthermore, there is much technical research work being carried on in connection with industrial production, the costs of which are not segregated as such but are accounted for as part of production costs and hence are not included in the total sum here given.

# Business News and Market Conditions

## Near Record Activity in October

### Operations of Electrical Manufacturing Plants Last Month Were 0.4 Per Cent Over 1926—Ten Months' Production 3.2 Per Cent Over Last Year's

THAT the electrical manufacturing plants of the nation are operating slightly above the level reported at this time last year is indicated by reports received by the ELECTRICAL WORLD on the monthly electrical energy consumption by a large portion of these plants. The rate of production of electrical equipment and supplies during October was 4.6 per cent above September and 0.4 per cent over October last year. December of last year is the only month in the history of the industry in which the rate of productive activity in these plants exceeded that recorded during the current October. There is every indication, moreover, that a new record in average daily rate of production will be established by the industry before the year closes.

The index of activity in the electrical manufacturing industry based on consumption of electrical energy stands at 131.3 for October, as compared with 125.4 for September, and 130.7 for October, 1926. Comparative indexes of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are as follows:

| | |
|---|---|
| October, 1927 | 131.3 |
| September, 1927 | 125.4 |
| August, 1927 | 110.2 |
| October, 1926 | 130.7 |
| October, 1925 | 109.7 |
| Average for first ten months of 1927 | 117.9 |
| Average for first ten months of 1926 | 114.3 |
| Average for full year 1926 | 116.6 |

The trend of production in the electrical manufacturing plants is following closely the operations as reported by national industry as a whole. General industry during October was operating at a rate about 0.8 per cent over October, 1926. Operations in general, however, were rather spotty, some industries reporting operations under last year, while other industrial groups just as important were producing at a rate materially above 1926.

## French Tariff Changes

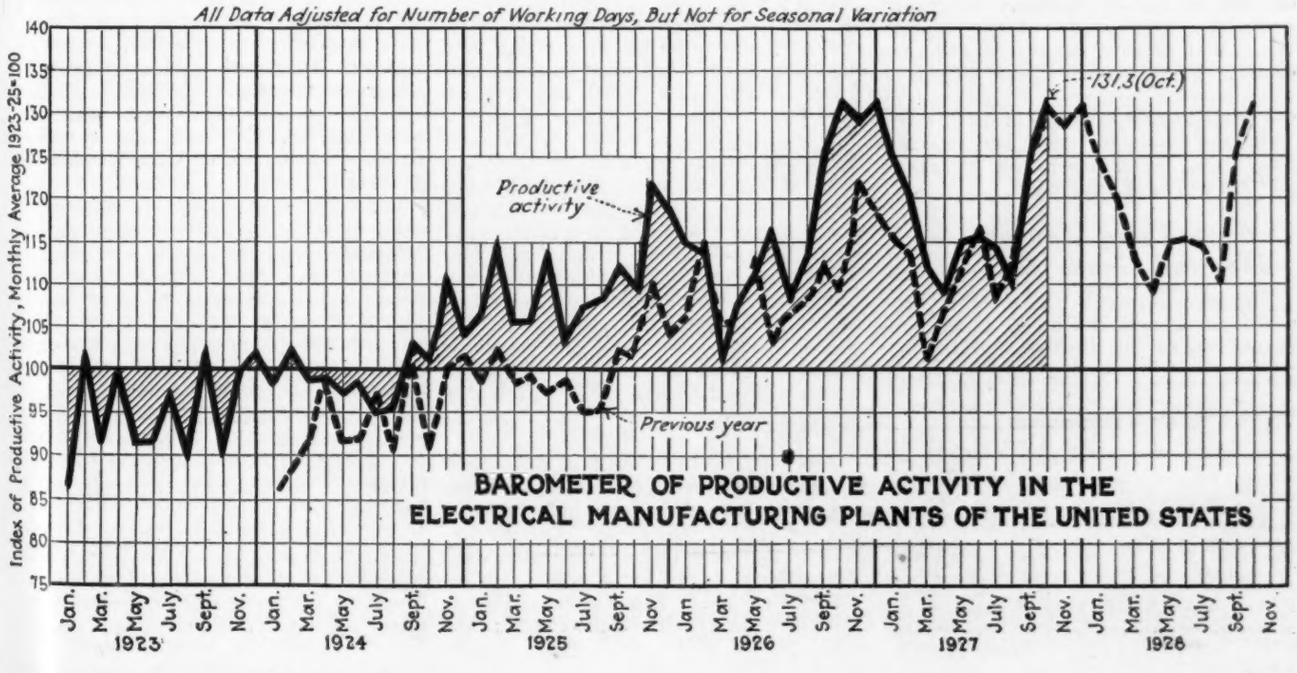
*Discrimination Against American Goods, Including Electrical Machinery, Has Been Abolished—A Preliminary to Commercial Treaty*

ON NOV. 21 the French government removed the tariff discriminations on American goods in connection with the partial tariff revision effective Sept. 6 by restraining those products to substantially the tariff treatment accorded them before that date, according to a communication from the French Foreign Office to the American Embassy at Paris received by cable in the Department of Commerce. The precise rates which will be levied after Nov. 21 on the American goods concerned are not yet definitely known, pending receipt of the text of the decree designed to put this régime into operation.

It is understood that in so far as the new tariff classifications allow, the duties levied on the American goods concerned prior to Sept. 6 will be restored, unless the new minimum rates of the French tariff on those articles, established in connection with the Franco-German treaty, are higher than the former rates for American products, in which case the new minimum rates will apply. In those cases where classifications have been changed an adjustment has been reported worked out by co-operation of experts of the French government with Commercial Attaché C. E. Herring of the Department of Commerce, attached to the American Embassy at Paris, so as to assure those products substantially their prior tariff treatment. This action on the part of the French government follows as a result of the exchanges of notes between the two governments during the last two months, and is intended to prepare the way for the commencement of negotiations at an early date for a permanent commercial treaty which shall govern relations between the United States and France.

## Exports to Chile Show Striking Increase

United States exports of electrical equipment and machinery to Chile increased 200 per cent in 1926 as compared with either of the two preceding years, a trade bulletin by the Commerce Department reveals. The total value of the various electrical items shipped to this South American republic last year reached a total of over $5,000,000, making Chile fourth in the list of our international customers for electrical merchandise. Exports of generating equipment showed the largest gain, rising



from a value of less than $100,000 to $800,000; transmission and distribution apparatus ranked second, the increase in this class being approximately $650,000, while industrial equipment gained $600,000. Household apparatus rose from $372,000 to $839,000, while lighting fixtures also registered a large gain. In fact, the report points out, no losses were shown in any group of electrical goods shipped to Chile in 1926.

This substantial increase in our electrical goods business in the Chilean market, the report shows, resulted from the construction of additional electrical plants, the opening of new electric lines and the continued modernization of industries and mines. While household electrical apparatus is still far from being in general use, the lowering of domestic rates in the important cities of the republic has given a marked impetus to the sale of this type of apparatus. The United States, according to the report, is now supplying approximately one-half of Chile's total electrical imports. Germany ranks second with about 25 per cent, while British products account for a little less than 20 per cent.

# Market Conditions

SALES in the industry are showing some improvement. Electrical men are decidedly optimistic. While the total business is running about 5 per cent below that of 1926, conditions have improved this fall. This is the reverse of the situation in 1926, and, coupled with the general business sentiment, it indicates continued good business. The carrying out of a real market development program as planned by the electrical industry should materially improve business in 1928.

In New England buying of equipment is in steady volume. Many inquiries are being received and a number of interior lighting contracts are anticipated. Inquiries in the Eastern district promise an early sales increase. Sales during December are expected to show a good average, although November business will probably be below that of October. Moderate orders for line materials were placed in the Southeast, and a fair number of inquiries are reported in the industrial field. In the St. Louis district the prospects appear bright. There has been an improved demand for wiring supplies. Increasing business is noticeable in the Middle West, and general conditions are favorable. The Campbell's Soup Company plans a large factory in Chicago. On the Pacific Coast sales are at a fair level. Industrial plants are active and an order was placed by a paper mill for about $90,000 worth of equipment.

## *Copper Again Advances—Demand Good*

Further advance in the price of copper has been recorded owing to the sustained buying by Europe and the increased sales to domestic consumers. The American Brass Company on Nov. 19 advanced the price of all its copper products ¼ cent per pound, with the exception of copper wire and cable.

Lead sales improved probably because of the increased price quoted in London, but the American Smelting & Refining Company has maintained its official contract figure at 6¼ cents. The price of zinc ore advanced and gave the zinc market its first upward trend in a number of weeks.

NEW YORK METAL MARKET PRICES

| | Nov. 16, 1927 Cents per Pound | Nov. 23, 1927 Cents per Pound |
|---|---|---|
| Copper, electrolytic | 13¾ | 13¾ |
| Lead, Am. S. & R. price | 6¼ | 6¼ |
| Antimony | 10¼ | 10¼ |
| Nickel, ingot | 35 | 35 |
| Zinc spots | 6.025 | 6.20 |
| Tin, Straits | 57¼ | 58 |
| Aluminum, 99 per cent | 25 | 25 |

Base copper price Nov. 23, 1927, 15¼ cents.

## *Orders for Line Material Placed in Southeast*

Central-station purchases have decreased materially in the Southeast, while a fair number of inquiries represents the activity in the industrial line. Industrial projects now under consideration will probably not get under way until the first of the new year. A town in Louisiana placed an order last week for a turbine switchboard and accessories totaling $75,000. New construction activities of some of the larger companies are reflected in orders of moderate size for line construction materials, one company ordering in the past ten days $6,500 worth of miscellaneous line materials and $2,200 worth of creosoted pine poles. The sales volume of meters and transformers is below the average for several weeks past, but one company ordered last week house type watt-hour meters totaling $5,500 and distribution transformers amounting to $3,700. Another central-station order was for $3,300 worth of small disconnect switches. Power companies' efforts are assisting materially in stimulating the use of electric signs and one company closed an order for a sign installation which will cost $3,500. A small town in Georgia placed an order for a 125 standard "white way" installation.

Jobbers state their business is holding up reasonably well, particularly in heating device lines, though the holiday trade has not yet got into swing. One jobber reports the receipt of $2,500 inside wiring material order for a school job in south Georgia. The Georgia Power Company has purchased the electric distribution system of Jefferson and undertaken the retail operation of same. Reports have been received that the Carolina Power & Light Company has acquired the municipal power plant at Spring Hope, N. C., and will build a transmission line to that point.

## *Inquiries Promise Sales Increase in Eastern District*

A noticeable increase in inquiries for electrical equipment in the Eastern district is reported, and it is expected that December will show actual bookings on a number of accounts. The demand for heavy apparatus is spasmodic, although a little business covering central-station work in this territory is now looming ahead. Transmission-line equipment, including wire, insulators and hardware shows signs of revival in several quarters and fairly early commitments are anticipated. Wiring materials, conduit, etc., are showing fair transactions, and specialty business, with the approach of the holidays, is picking up. Electric appliance sales are reported as improving, vacuum-cleaner business continues rather dull.

A prominent manufacturer in the Eastern district says that sales show a decrease during the present month as compared with October, with indications that December will give a higher average. This company has recently booked orders for 1,500-kw. and 1,000-kw. motor-generator sets for iron and steel interests at Chicago, and a number of heavy-duty industrial motors for cement-mill service. A recent development of the business showing decided expansion is that of small motor-generator units for airplane utility. Motor-generator sets for radio transmitting purposes, averaging about 10 kw., have been another feature of bookings.

In the New Jersey area early industrial operations of sizable account are expected to develop an improved call for motors and other industrial apparatus, an aircraft plant is projected at Teterboro to cost about $100,000, a hosiery mill will be erected at Hackettstown to aggregate upward of $60,000, and two new wire-manufacturing plants will soon be established at Newark, each to represent an investment of from $50,000 to $100,000.

Trade at Philadelphia is exhibiting signs of revival. While central-station business remains sluggish with regard to heavy primary equipment, line work shows improved aspects. The organization of several groups of affiliated utility interests for which application for state charters has been made will develop the early construction of a number of township transmission lines in the eastern and central parts of the state. Substation apparatus is also expected to be in better call at an early date. Inquiries in both lines are active.

Construction activities in the Eastern district comprise the following: Plans have been filed by the New York Edison Company for a one-story power distributing station on the Spuyten Duyvil

Road, to cost about $150,000. The International Paper Company, New York, has approved plans for the construction of a 12,000-hp. hydro-electric power plant at Kent's Falls, on the Saranac River, near Plattsburg, N. Y. The Pennsylvania Railroad Company, Philadelphia, is asking bids until Nov. 29, for transmission towers to be used in connection with local system electrification. The McClintic-Marshall Company, Pittsburgh, will build a one-story addition to its main steel-fabricating shop at Pottstown, Pa., reported to cost more than $200,000, with equipment. The Pittsburgh Plate Glass Company, Pittsburgh, will require a large quantity of electrical equipment for a projected glass plant at Los Angeles, Cal., for which a tract of land is now being selected, estimated to cost more than $2,500,000.

## *Business at Fair Level on Pacific Coast*

Power-company inquiries on the Pacific Coast have been comparatively light. They include an unusually high proportion of rigid iron conduit and assorted carloads of poles. Street-lighting inquiries are numerous and include $2,000 worth of No. 8 varnished-cambric, lead-covered 3,000-volt cable for Sacramento, $20,000 worth of assorted park cable and 100 1-kva. transformers for Fresno, $4,000 worth of parkway cable for San Mateo and $3,500 worth for the Hawaiian Islands. A Sacramento Valley industrial plant bought a 200-hp. motor valued at $5,000 and a San Joaquin Valley plant a six-panel switchboard for $4,500. The outstanding industrial order of the week covers a 625-kva. Westinghouse turbine and a sectional paper-machine drive at a total value of $90,000 for spring delivery to a Port Townsend paper mill. Another unusual order for size covers one and one-third carloads of residence-type watt-hour meters for a northern and central California system. The shipment includes 3,300 meters valued at $28,000. Dealers report excellent radio business with the call now veering to small, compact receiving sets. A rather poor washer and vacuum-cleaner business and a late season for hollow ware. The Heinz company of Pittsburgh plans to build a million-dollar addition to its Berkeley plant.

A survey made by the largest electrical jobber in Seattle disclosed business conditions fair and comparable to this time last year, with central-station companies buying about the same, to meet requirements only, and contracting business about 30 per cent off. Range and smaller appliance business is good. Scattered orders for motors ranging from 50 hp. down were received for replacements in lumber and shingle mills and allied industrial plants. A Puget Sound lumber mill bought six 15-hp. motors for a dry kiln, and an order was placed for three 700-hp. hydraulic turbines direct-connected to 30-in. centrifugal pumps for a Wapato (Wash.) pumping project. The city of Seattle bought $1,500 worth of carbon brushes and opened bids for 6,000 porcelain insulators. Industrial projects planned include a 50-ton sulphate pulp mill for the Willapa Pulp & Paper Mills at South Bend, Wash., two 50-ton pulp-mill units at Junction City, near Aberdeen, for the West Lumber & Pulp Company and a million-dollar electro-chemical plant in Tacoma for the Tacoma Electro-Chemical Company. The town of Montesano also plans the immediate installation of a street-lighting system covering the entire business district.

Other construction projects are: The city of Los Angeles plans the installation of an ornamental lighting system on Hammel Street and a portion of Hazard Street. The City Council, Napa, Cal., is considering the installation of a municipal electric light and power plant. The Portland (Ore.) Electric Power Company has purchased land at Salem, Ore., as a site for a proposed equipment storage and distributing plant, to cost about $75,000. The City Council, Idaho Falls, Idaho, is planning a municipal hydro-electric power plant to cost about $100,000, with transmission lines.

## *Prospects Appear Bright in St. Louis District*

No very large contracts have been closed in the St. Louis district, but reports from manufacturers and large dealers have a somewhat more optimistic tone than those of the previous week. An order was placed for a motor-driven air compressor to cost $10,000. Another order noted for six 200-hp. motors, to drive line pumps for a Southwestern oil pipe line company, amounted to approximately $7,500. The St. Louis Water Department is asking for proposals for additional auxiliary equipment at the new pumping station, mostly large motor-operated valves, estimated to cost $40,000. There has been an improvement in the demand for wiring supplies of all kinds and inquiries have increased materially.

Current construction projects in the district include the following: The Empire District Electric Company, Joplin, Mo., has authorized the construction of a transmission line from a point near Purdy to Cassville, Mo. The Missouri Power & Light Company, Jefferson, Mo., has approved plans for enlargement to its power plant. The Board of Public Works, St. Joseph, Mo., plans an ornamental lighting system to cost about $37,000. The City Council, Sapulpa, Okla., is arranging a fund of $15,000 for the installation of an ornamental lighting system. The Arkansas-Missouri Power Company, Blytheville, Ark., plans the construction of a transmission line from Manilla to Paragould, Ark. The City Council, Fredericksburg, Tex., is considering the installation of an ornamental lighting system. The Texas-Louisiana Power Company, Fort Worth, Tex., is planning the construction of a transmission line from Midway to Whitney, Tex. The City Council, Morgan City, La., is considering the construction of a municipal electric light and power plant, estimated to cost $100,000.

## *New England Buying Equipment in Steady Volume*

Orders for electrical equipment in New England called mainly for small motors and central-station supplies. No outstanding orders for large equipment were reported, motor sales were good and a number of orders for medium-sized motors were placed. Transmission-line materials are moving, and a number of transformers were placed in northern Vermont and New Hampshire. A prominent manufacturer, referring to recent flood devastation, said that the salvage on electrical equipment will be high.

Inquiries for power equipment are being received. The continuing fair volume of new construction in sight presages several outstanding interior lighting contracts, among which might be mentioned a new addition to the Harvard Law School, and a number of hospital projects. The Field Shoe Company, Bridgewater, Mass., is planning to install complete electric drive in its new plant; a project is being considered for erection of a power plant for the city of Springfield, Mass., and bids are being advertised for by the State of Massachusetts for construction of 12-mile tunnel for extension of new water supply. Other construction projects reported are the following: The city of Hartford, Conn., is planning for extensions in the ornamental lighting system on Albany Avenue. The Board of Aldermen, Holyoke, Mass., has authorized a fund of $575,000 for the purchase of the local mill of the American Thread Company, the site to be used for extensions in the municipal electric and gas departments.

## *Large Factory Planned in Middle West*

Business in the Middle West has proved satisfactory in most cases. While some lines are spotty, general conditions are favorable. One of the most interesting items in the news of the day is the announcement of the decision of the Campbell Soup Company to establish an immense factory in the Chicago district giving employment to 2,500 persons. The various utility companies are busy with construction work. Among the interesting items ordered were: 4 600-amp. and 2 2,000-amp. 15,000-volt vertical isolated-phase oil circuit breakers, 26 Urelites, for apparatus control 780 direct-current watt-hour meters, 60 current transformers, "Mazda" lamps valued at $175,000 and 500,000 lb. of weatherproof wires and cables. Jobbers' sales are increasing in proportion to the general increase of business.

Construction activities include the following: The Wisconsin Valley Electric Company, Wausau, Wis., has authorized the construction of a substation at Stevens Point, Wis. The Consumers Power Company, Jackson,

Mich., has approved plans for the rebuilding of its transmission line from Newaygo to Fremont, Mich. The City Council, Woodriver, Ill., plans the installation of a pumping plant in connection with a proposed sewage system, to cost $490,000. The North Shore Park Board, Chicago, is considering the construction of a pumping plant at Eastwood and Lincoln avenues, to cost about $1,000,000. The City Council, Huntington, Ind., is planning extensions in the municipal electric lighting plant to cost about $60,000. The Municipal Service Department, Portsmouth, Ohio, plans the construction of a pumping plant, estimated to cost $135,000. The Inland Manufacturing Company, Dayton, Ohio, has filed plans for an addition to its power plant, to cost about $25,000. The City Commissioners, Duluth, Minn., have arranged a fund of $97,000, for extensions and improvements in the street-lighting system. The Carney Cement Company, Mankato, Minn., plans installation of electric equipment in the proposed rebuilding of its mill. The Northwestern Paper Company, Cloquet, Minn., plans an addition to cost about $900,000. The Northern Nebraska Power Company has secured permission to make extensions in power dam and station at O'Neill, Neb., to cost approximately $275,000.

The City Council, Cedar Rapids, Iowa, is asking for bids until Dec. 5 for an ornamental lighting system on Sixteenth Street. The Iowa Railway & Light Company, Cedar Rapids, Iowa, has secured permission to construct about 40 miles of transmission lines in Cedar, Carroll, Greene and Linn Counties and contemplates the construction of a substation at Boone, Iowa. Sealed proposals will be received at the office of the Commissioner of Purchases and Supplies, City Hall, Cleveland, until Dec. 2, for series-multiple transformers for the Division of Light and Power.

# Activities of the Trade

## American Radiator Buys American Blower Company

The American Radiator Company, New York, has acquired the American Blower Company of Detroit giving in exchange its own common stock to the value of about $4,000,000. The organization of the acquired company will not be changed, but the business will be conducted by a new company to be known as the American Blower Corporation. Plans are being discussed for recapitalization of the American Blower Company.

## Cedar Grove Stove to Market Line of Electric Ranges

A complete line of electric ranges is now being designed by the Cedar Grove Stove Company, Cedar Grove, Wis. As the forerunner of the line the "Electri-Cook" is now announced. It is an automatic floor-plug range equipped with two ovens. The unit also is provided with time control. The company plans to announce other models in a few weeks.

## Ohio Brass to Set up Executive Branch in New York

An executive branch will be established by the Ohio Brass Company of Mansfield, Ohio, in the New York office about Jan. 1 next. This branch will cover New England and the territories served by the present New York and Philadelphia sales offices. Frederic Attwood, who directed the interests of the Ohio Brass Company in Europe for several years, has recently returned to this country to undertake the organization and direction of the New York executive office of the company.

It is rumored that negotiations are under way by the Ohio Brass Company for the acquisition of the Locke Insulator Corporation, Baltimore, Md.

## Westinghouse Furnishes Unit for Senju Plant in Japan

The Tokio Electric Light Company of Japan recently placed, through the Westinghouse Electric International Company, an order with the Westinghouse Electric & Manufacturing Company for one 25,000-kw. turbine generator. The unit will be built at the South Philadelphia works of the Westinghouse company and installed in the new extension of the Senju power plant, a steam standby station.

Like the other two units of similar design in the same plant, this turbo-generator will be fitted with a special disconnecting coupling so that the generator can be operated as a synchronous condenser.

THE FALK CORPORATION, Milwaukee, announces that arrangements have been made with William Kennedy & Sons, Ltd., Owen Sound, Ontario, Canada, whereby that company is to manufacture and sell Falk continuous-tooth herringbone gears, herringbone speed reducers and flexible couplings in Canada.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received an order for a 35,000 kw. turbo-generator unit and condensing equipment for the Neches station of the Gulf States Utilities Company, Beaumont, Tex. The West Coast Theater Corporation of San Francisco has ordered two switchboards, one a 116-circuit, five-scene multi-preset type, the other a 58-circuit lead-front single-scene board. A Huntington (W. Va.) theater has ordered one two-scene preset-type switchboard.

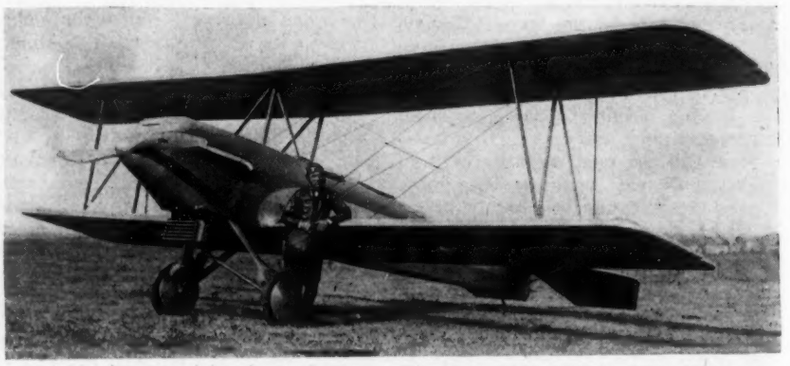
THE FEDERAL ELECTRIC COMPANY, 8700 South State Street, Chicago, announces that it has added to its line the Federal-Thor folding 40 electric ironer, the model 28 Federal "Moto-brush" vacuum cleaner, the type S Federal washer, and the "Fedeleo" ball-bearing electric vacuum cleaner.

THE BULL DOG ELECTRIC PRODUCTS COMPANY, 7610 Jos. Campau Avenue, Detroit, announces a new line of Bull Dog "Saftofuse" power and light distributing feeder panelboards.

THE MARTINDALE ELECTRIC COMPANY, 1260 West Fourth Street, Cleveland, has taken over the exclusive sale and distribution of all industrial types of Hullhorst motor-driven commutator undercutters and slotters manufactured by the Hullhorst Micro Tool Company of Toledo, Ohio.

THE WALKER & PRATT MANUFACTURING COMPANY, Boston, reports that H. W. Parrish, Jr., formerly merchandise manager of the Alabama Power Company at Birmingham, has been made Southern district manager for the Walker-Pratt company.

## Using an Airplane to Sell Equipment



T. F. JOHNSON, JR., ATLANTA, GA., MANUFACTURER OF LIVE-LINE MAINTENANCE TOOLS, USES THIS AIRPLANE TO CALL ON HIS CUSTOMERS

# New Equipment Available

## Centrifugal Pumps

A line of high efficiency centrifugal pumps recently has been developed by the Worthington Pump & Machinery Corporation, 115 Broadway, New York. These new pumps are being carried in stock for standard motor speeds up to 3,600 r.p.m. The new lines available embrace three types as follows: A single-stage, single-suction type (known as R and S); a two-stage, single-suction type (known as U) and a single-stage, double-suction type (H, L and M). The design of the new pumps is such that no pump will overload a standard motor of the horsepower and speed specified under any operating conditions to which the pump may be subjected while in service.

The manufacturer states that these new pumps are the result of a detailed study of pump services undertaken with a view towards designing new lines of high efficiencies especially for those heads and capacities most commonly specified by users. The pump casing is horizontally split. In the single-suction pumps the back of the impeller acts as a hydraulic balance. Double-suction types are inherently hydraulically balanced. All the new pumps are equipped with deep-groove ball bearings, the outboard bearing being so mounted as to take any unbalanced thrust in either direction. The bedplate is designed to take a standard make of motors.

## Welding Press

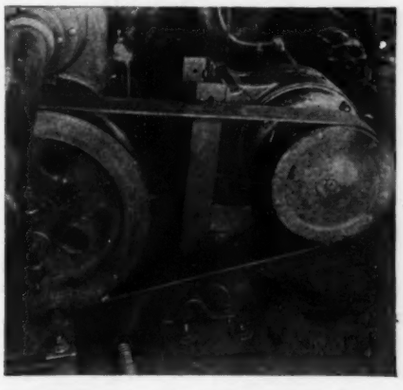
A welding press, a combination of an automatic spot welder and a punch press which differs radically from an automatic spot welder in both construction and in results of operation, has been developed by the Gibb Welding Machines Company, Bay City, Mich. The company states that an entirely new principle in spot welding is employed in that where spots are normally made in one second the welding press makes spots in one-hundredth part of a second. This is accomplished by means of an especially designed transformer and a precisely timed automatic switch. The transformer in its action has the characteristics of a condenser. The object of this new principle in spot welding, quite aside from the speed of operation, is to make welds eliminating depressions in the surface, warpage and discoloration. Welds are said to be made with this machine at the rate of two hundred or more spots per minute.

The welding press has a toggle action which quickly brings the welding points lightly into contact with the work and a final forging pressure which can be without limit. A particular field of application is in the welding of light to heavier parts. It is said to be ideal for finely polished surfaces where finish counts, such as automobile bodies, auto parts, etc. There are also many other special applications. This welder is also said to eliminate the uncertainty in welding the non-ferrous metals such as brass and aluminum.

## Belt Drive

A belt drive adapted to close pulley centers, and known as the Rockwood "Uni-Pull" drive, has been developed by the Rockwood Manufacturing Company, Indianapolis. The drive is said to operate at all times with uniform tension, pull and speed.

The drive consists of a Rockwood pulley and a motor so mounted that gravity weight maintains the belt under a predetermined tension to meet the power requirements of the installation. In tests conducted by the manufacturer belts were run at centers so close that the pulleys almost touched. In one installation an ordinary leadpencil could not be inserted between the pulleys. The manufacturer claims that with the "Uni-Pull" drive the method of mounting makes possible the maintenance of the tension entirely independent of the effect of centrifugal force.



SHORT CENTER BELT DRIVE UTILIZING WEIGHT OF MOTOR TO OBTAIN PROPER TENSION

## Variable-Speed Transmission

The "JFS" variable-speed transmission, which is available in standard sizes to transmit from ½ hp. to 15 hp. at the maximum reduction, has been developed by the Stephens-Adamson Manufacturing Company, Aurora, Ill. In the device the actual transmission of power is accomplished through the resulting action of roller bearings revolving in polished races submerged in oil. The pressures between the rollers and races, sufficient to transmit their rated horsepowers, are only a fraction of the allowable unit pressures common to the usual ball and roller bearing loadings. A hand or sprocket wheel is used to adjust the rate of rotation of the low-speed shaft to any speed within the range. Variations in speed are made without interruption while the machine is in motion. The machine may be driven in either clockwise or counter-clockwise direction with the same efficient results.

There are two distinct series of these machines. The first series provides a reduction of approximately eight to one for the lowest speed. The second series provides a reduction of approximately forty to one for the lowest speed. Each of the series has a variable range of approximately five to one, as is shown in the following examples: The series "R" transmission directly connected to a 1,200-r.p.m. motor will furnish power at any speed from 150 r.p.m. up to 750 r.p.m. The series "RG" transmission directly connected to a 1,200-r.p.m. motor will furnish power at any speed from 30 r.p.m. up to 150 r.p.m.

## Crane and Winch for Public Utility Work

A new type of crane and winch specially designed for public utility work nas been placed on the market by the Mead-Morrison Manufacturing Company, Boston. The crane, with a capacity of 5,000 lb., may be mounted on the rear right corner of a truck for handling heavy transformers in loading them on the body platform or lowering them into manholes. A special winch, hoisting and lowering by power, provides positive control and safety in handling the units. The winch when not operating the crane may be used for cable-pulling and pole-handling work.

## Potential Transformers

A line of indoor dry-type potential transformers for instrument service has been placed on the market by the Packard Electric Company, Warren, Ohio. They are of inclosed steel-clad design, embodying mechanical protection to the windings, and are known as the type PD, superseding the type SB potential line. They are available with a capacity of 50 volt-amperes for voltages from 220 to 2,200, and with a capacity of 200 va. for voltages from 2,200 to 13,200.

The 200-va. capacity units are compensated for maximum accuracy at 50 va. secondary burden, and are said to have a ratio accuracy within one-half of 1 per cent and a phase angle within 30 minutes at the compensated point and at 20 per cent power factor, or higher, secondary burden. The units are said to be especially designed for installations where accuracy is of prime importance.

MOTOR GRINDER.—A portable motor grinder in which the power unit can also be adapted as a utility motor has been placed on the market by the Master Electric Company, Linden and Master Avenues, Dayton, Ohio. Since the unit consists of a standard ¼-hp. motor with the grinding attachment readily removable, it can be stocked as a grinder unit with the opportunity to sell the motor separately if desired.

# Electrical Patents

*Announced by U. S. Patent Office*

(Issued Nov. 1, 1927)

1,647,337. SPEED REGULATOR; W. M. Bradshaw and J. H. Ashbaugh, Wilkinsburg, Pa. App. filed Dec. 8, 1925. For governing the speed of electric motors.

1,647,346. RESISTOR-SUPPORTING MEANS; K. Ehrgott, East Pittsburgh, Pa. App. filed Jan. 23, 1925.

1,647,347. CIRCUIT-CLOSING DEVICE; K. A. Ekberg, New York, N. Y. App. filed July 30, 1925. For the actuation of burglar and hold-up alarms.

1,647,348. SYSTEM OF DISTRIBUTION; C. Le G. Fortescue, Pittsburgh, Pa. App. filed April 13, 1922. Distribution of energy or power to electric railway systems and the like.

1,647,355. CONNECTING DEVICE; W. F. Hendry, Ossining, N. Y. App. filed Jan. 7, 1924. Base for electrical attachment plugs.

1,647,418. ELECTRIC RECTIFIER; M. B. Stazak, Chicago, Ill. App. filed July 17, 1920. Vibrating type.

1,647,469. SAFETY DEVICE FOR TROLLEY CARS; B. Phillips, Chicago, Ill. App. filed July 27, 1925. To prevent accidental starting of the car when trolley pole is put on the line after the car has been out of service.

1,647,505. OUTLET BOX AND FIXTURE SUPPORT; W. J. Cormay, Auburndale, Mass. App. filed July 2, 1926.

1,647,511. CONDUIT BOX; R. P. Dunmire, Erie, Pa. App. filed Dec. 19, 1925. For use with threadless couplings.

1,647,524. ELECTRIC TUNNEL KILN; J. Kelleher, Chippawa, Ontario, Canada. App. filed June 26, 1925.

1,647,563. HIGH-TENSION ELECTRIC CABLE; L. Emanueli, Milan, Italy. App. filed April 26, 1926. Insulated with paper or textile material which has been saturated with oil and covered with a lead sheath.

1,647,566. GUARD FOR ELECTRIC METERS; C. J. Gillen, Carbondale, Pa. App. filed March 20, 1926. For meter service.

1,647,591. GASEOUS DISCHARGE LAMP; C. C. Van Voorhis, Princeton, N. J. App. filed June 21, 1923.

1,647,593. BASE FOR THEFT-PROOF LAMPS; F. W. Walton, East Orange, N. J. App. filed April 10, 1925.

1,647,595. ELECTRICAL DEVICE FOR EMITTING LIGHT FLASHES AND INTERRUPTING CIRCUITS; P. T. Weeks, Caldwell, N. J. App. filed June 17, 1922.

1,647,615. ELECTRICAL COIL; J. O. Gargan, Brooklyn, N. Y. App. filed Feb. 7, 1924. Adapted to inductance coils suitable for use in high-power radio transmitters.

1,647,618. METHOD OF PRODUCING A HIGH VACUUM IN VESSELS; D. S. Gustin, Newark, N. J. App. filed Sept. 6, 1922.

1,647,624. MACHINE FOR AND METHOD OF MOUNTING FILAMENTS; J. J. Higgins, East Orange, N. J. App. filed May 8, 1923.

1,647,632. CIRCUIT BREAKER; E. H. Jacobs, Chicago, Ill. App. filed Aug. 4, 1919. High-speed oil circuit breaker.

1,647,633. AUTO-START MOTOR; Los Angeles, Cal. App. filed June 10, 1925.

1,647,645. ELECTRICAL GENERATOR; W. A. Marrison, East Orange, N. J. App. filed July 12, 1924. Constant-frequency alternating-current generators.

1,647,647. NON-ARCING ELECTRIC LAMP; W. A. McKay, Bloomfield, N. J., and C. C. Colby, Newark, N. J. App. filed July 29, 1924.

1,647,649, 1,647,650. ELECTROLYTIC RECTIFIER; W. Morrison, Chicago, Ill. Apps. filed Oct. 15, 1925.

1,647,652. ELECTRIC-CURRENT-AFFECTING DEVICE; H. J. Murray, Brooklyn, N. Y. App. filed Sept. 15, 1921. Variation of electric current by means of a light-sensitive resistance-changing element.

1,647,697. ELECTRICAL CONNECTER; W. F. Hessel, New York, N. Y. App. filed Nov. 24, 1919.

1,647,699. CABLE JOINT; A. O. Hoeftmann, Worcester, Mass. App. filed April 11, 1924. For armored electric cables of the submarine type.

1,647,708. DOORBELL AND LIGHT CONTROL SWITCH; P. D. Monica, Harrison, N. Y. App. filed Feb. 4, 1925.

1,647,726. ELECTRIC FURNACE; F. T. Cope and R. F. Benzinger, Salem, Ohio. App. filed March 6, 1926. Metallic resistor type; means for supporting sinuous resistor grids, particularly beneath the hearth of the furnace.

1,647,748. HEATING DEVICE FOR HAIR TREATMENT; A. E. Reimers, Harrington Park, N. J., and W. K. Tavender, Holworth, N. J. App. filed Sept. 25, 1925.

1,647,762. CONNECTER; E. H. Wiseman, Cleveland, Ohio. App. filed May 8, 1924.

1,647,787. ELECTRIC INDUCTION FURNACE; J. R. de Zubiria, Bilbao, Spain. App. filed April 16, 1926.

1,647,792. SWITCHING DEVICE; E. W. Gent, Morristown, N. J. App. filed June 20, 1921. Relay of the multi-contact type.

1,647,858. ELECTRIC SIGNAL; C. W. Dunham, Wilkinsburg, Pa. App. filed Dec. 7, 1923. Highway crossing signal.

1,647,869. APPARATUS FOR DIMINISHING INJURIOUS EARTHING CURRENTS; J. Jonas, Baden, Switzerland. App. filed Aug. 29, 1921.

1,647,894. INDICATOR; F. R. Wasserkampf, Kiel, Germany. App. filed April 17, 1924. For transmitting motions to a distance by electricity.

1,647,905. DEVICE FOR TESTING INSULATORS CARRYING LIVE WIRES; L. P. Delsasso, B. F. Dengler and E. R. Stauffacher, Los Angeles, Cal. App. filed May 9, 1922.

1,647,928. TRANSFORMER FOR ELECTRIC ARC CUTTING AND WELDING APPARATUS; F. C. Owen, Fayeteville, N. C. App. filed Nov. 14, 1925.

1,647,946. LIGHTING FIXTURE; J. Williamson, Chicago, Ill. App. filed March 17, 1926.

1,647,947. LIGHTING FIXTURE; J. Williamson, Chicago, Ill. App. filed July 31, 1924.

1,647,949. PRESSURE ELECTRIC SWITCH; J. F. Winkler, Philadelphia, Pa. App. filed Nov. 16, 1921.

1,647,951. ELECTROMAGNETIC CHUCK; J. Bing, Eisemach, Germany. App. filed Dec. 11, 1924.

(Issued Nov. 8, 1927)

1,648,019. ELECTRIC ARC LAMP; L. S. Kubiac, Youngstown, Ohio. App. filed Nov. 9, 1926. Multiple type.

1,648,022. ELECTRIC SWITCH; J. Lofgren, Chicago, Ill. App. filed Nov. 2, 1925. Inclosed within a housing or casing and of heavy construction so that it may be employed on locomotives and in other situations where the device will be subjected to an unusual amount of vibration and to rough usage.

1,648,169. ELECTRIC IRON; F. A. Fahrenwald, Cleveland Heights, Ohio. App. filed Feb. 6, 1922.

1,648,177. ELECTRIC WELDING APPARATUS; L. H. Hoffer, Brooklyn, N. Y. App. filed Nov. 3, 1925. With means for controlling the succession of operations.

1,648,197. WATER-OPERATED CIRCUIT CLOSER; B. T. Roodhouse, Wilmette, Ill. App. filed March 22, 1926. May be placed so as to detect leaks.

1,648,231. THERMOCOUPLE; O. Hermann, Chicago, Ill. App. filed Nov. 9, 1925.

1,648,239. HAIR-WAVING DEVICE; C. G. Nessler, New York, N. Y. App. filed July 30, 1926.

1,648,326. CURRENT TAKE-OFF CLAMP; A. L. Sawyer, Old Town, Me. App. filed Sept. 18, 1926. Line tapper.

1,648,335. WAFFLE IRON; C. M. Cole, Oakland, Calif. App. filed Aug. 15, 1926.

1,648,348. ELECTRIC RELAY; A. E. Hudd, Liverpool, England. App. filed June 21, 1921. Employed in railway signaling systems and known as the "track circuit" relay.

1,648,351. SEPARABLE ATTACHMENT PLUG; A. H. Kline, Chicago, Ill. App. filed April 25, 1925.

1,648,385. ELECTRIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed April 4, 1925. Having a pivoted switch member and a relatively stationary switch member.

1,648,390. SAFETY SWITCH MECHANISM; I. E. McCabe, Chicago, Ill. App. filed Nov. 8, 1926. Temperature-control safety-switch mechanism.

1,648,414. PRESSURE-OPERATED CIRCUIT CLOSER; I. E. McCabe, Chicago, Ill. App. filed May 7, 1923.

1,648,416. METHOD OF WELDING STEEL SASH; C. J. McIntosh, Milwaukee, Wis. App. filed Nov. 1, 1926.

1,648,419. GOVERNOR; A. F. Meyer, St. Paul, Minn. App. filed March 6, 1925. Regulator for the control of fluid flow and pressure.

1,648,443. ELECTRIC CABLE; S. C. Cawthon, Western Springs, Ill. App. filed June 27, 1925. Submarine cable.

1,648,460. ELECTROMAGNETIC ELEMENT; R. J. Miller, Crafton, Pa. App. filed Oct. 17, 1927. Adapted for use in a recording voltmeter.

1,648,506. TIME-CONTROL CUT-OUT SWITCH; A. Plein and J. W. Hoffmann, Milwaukee, Wis. App. filed July 19, 1926.

1,648,508. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; E. O. Schweitzer, Chicago, Ill. App. filed Dec. 6, 1918.

# New Trade Literature

JUNCTION AND JOINT BOXES.—The Standard Underground Cable Company, Pittsburgh, has issued bulletin No. 720-1 describing the "Standard" junction and joint boxes. Numerous drawings, illustrations and dimension tables are included.

POLES.—The Union Metal Manufacturing Company, Canton, Ohio, is distributing a catalog describing and illustrating the Union Metal distribution and transmission poles.

COAL-DUST COLLECTOR. — Bulletin No. 1124, entitled "Collecting Fly Ash and Coal Dust," issued by the American Blower Company, Detroit, describes and illustrates the type D "Sirocco" collector. This bulletin supersedes bulletin No. 1028.

HIGH-TEMPERATURE INSULATION. —A booklet entitled "High-Temperature Insulation" has been issued by the Celite Products Company, 11 Broadway, New York City. This is a copy of a lecture which includes data on methods of measuring heat flow through walls as well as temperature gradients and heat losses through typical insulated and uninsulated walls. Drawings are included showing methods of insulating various types of high-temperature equipment such as boilers, furnaces, blast furnaces, stacks, open-hearth regenerators and flues, etc.

OUTDOOR LIGHTING EQUIPMENT AND LANTERNS.—The Artistic Lighting Equipment Association, 420 Lexington Avenue, New York City, is distributing a booklet showing various phases and applications of outdoor lighting equipment. It gives the origin and development of the lantern. Illustrations showing the artistic and decorative possibilities and the utilitarian advantages and protective features of exterior lighting are included in the booklet.

OIL BURNERS.—Electrol Inc., 170 Dorcas Street, St. Louis, has issued a catalog giving a complete analysis showing the relation of automatic oil heat to electric utility merchandising and the load-producing characteristics of oil-heating equipment. The company has also issued a bulletin entitled "The Master Furnace Man," covering electric oil burners and also an architects' bulletin which contains drawings of the various types of burners.

HEAT TRANSFER.—Bulletin No. 1133 issued by the Dampney Company of America, Hyde Park, Boston, gives the results obtained by the National Physical Laboratory of London on determinations of the heat transfer from tubes to which "Apexior" protective coatings had been applied.

TRANSFORMERS FOR SIGNALING DEVICES.—A leaflet issued by Edwards & Company, Inc., 140th and Exterior Streets, New York City, describes its bell-ringing type and heavy-duty type transformers for operating signaling devices.

ELECTRIC WIRING DEVICES. — The Arrow Electric Company, Hartford, Conn., has issued catalog No. 23, covering the Arrow products, including attachment plugs, indicators, plates, plug cut-outs, receptacles, rosettes, shade holders, signal devices, sockets, switches, etc.

# Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency are desired in Prague, Czechoslovakia (No. 28,255), for storage batteries.

A sole agency is desired in The Hague, Netherlands (No. 28,198), for electrical floor-polishing machines and electric washing machines.

Purchase and agency are desired in Mombasa, East Africa (No. 28,233), for generators and wiring supplies.

Purchase is desired in Berlin, Germany (No. 28,225), of farm-lighting plants.

An agency is desired in Constantinople, Turkey (No. 28,197), for wireless transmission apparatus.